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AIR FORCE Civil Engineer

The HORSE Is NOT Dead

Prime BEEF Delivers Again

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AIR FORCE Civil Engineer

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25th ANNIVERSARY

The **AIR FORCE CIVIL ENGINEER** is an official, non-directive HQ USAF publication, published quarterly under provisions of Chapter 2, **AFM 5-1.** Its purpose is to provide timely information to Air Force Civil Engineering personnel relating to mission accomplishment; to assist them in solving problems and improving efficiency of operation; to communicate new developments and techniques, and to stimulate professional thought and development. The Journal is edited and published by the Civil Engineering School, Air Force Institute of Technology. Contributions, suggestions and criticism are welcome.

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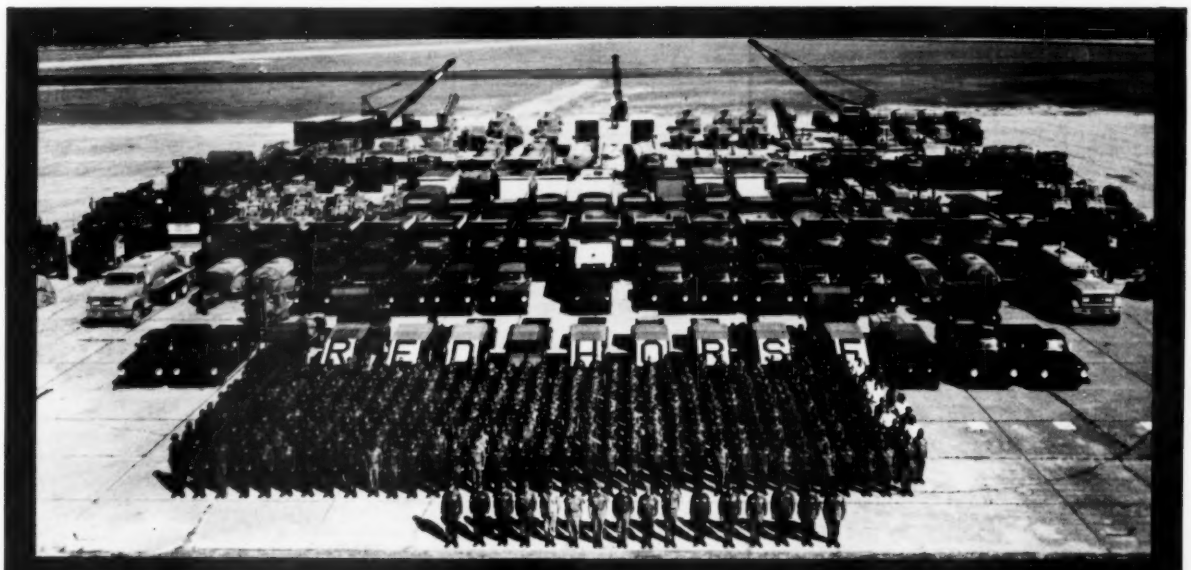
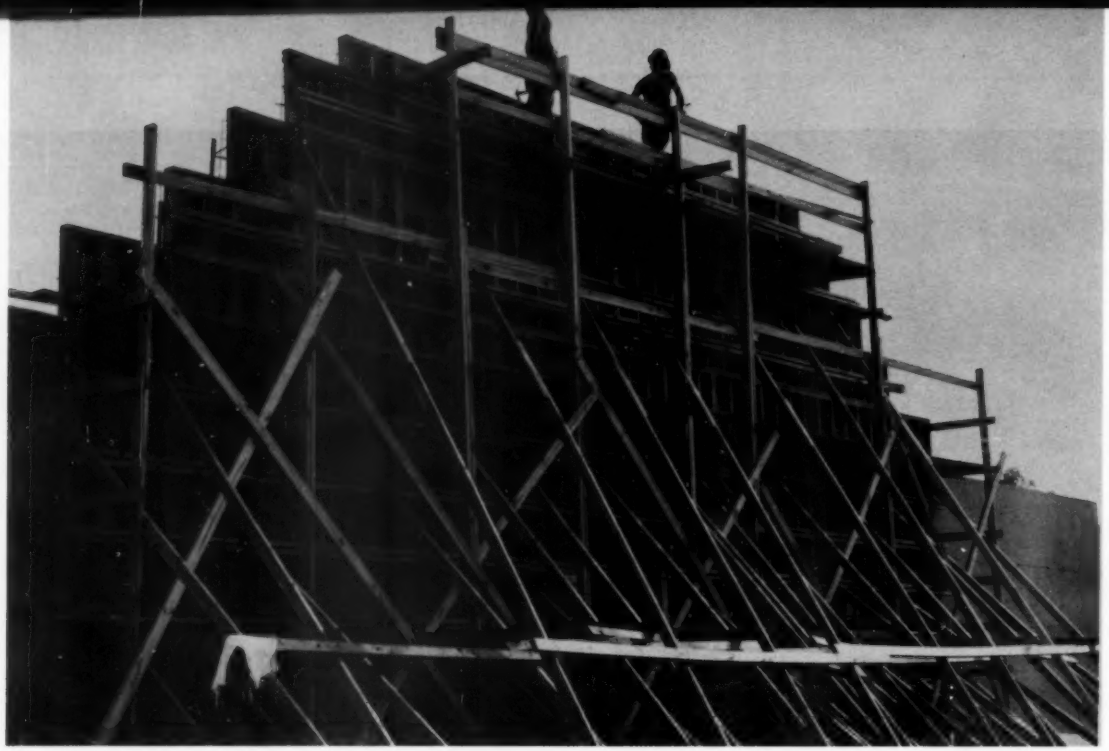


RED HORSE Squadrons still possess the punch they displayed so well in Southeast Asia . . . they have been improved to take on the added mission of mobility response. They train to deploy and employ in a manner which will best support current Air Force missions and future contingency plans . . .

The HORSE Is NOT Dead



Personnel of the 823rd Civil Engineering Squadron erected massive form framework for the cast-in-place headwall of the dummy aircraft shelter at Eglin Auxiliary Field No. 9, Florida.

How To Employ RED HORSE in the CONUS

by Maj John L. Moore, PE

Most people think of RED HORSE as the "do everything" outfit which got the Air Force out of the swamps and sands of Southeast Asia (SEA). RED HORSE squadrons were the units which carved an air base out of the jungle at U-Tapao, fought aggressors on the perimeter of Phan Rang, recovered facilities in the wake of the bomb dump blast at Da Nang and built hardened aircraft shelters at bases throughout Vietnam. RED HORSE men were known and respected for their work in SEA and these colorful squadrons have greatly enhanced the image of Air Force Civil Engineering (AFCE) throughout the Air Force. However, now that there is a de-escalation in Vietnam many people ask, "What has happened to the 'HORSE'?"

EXPLANATION OF PHOTOGRAPHS ON PRECEDING PAGE:

This grouping of 400 men and over 220 pieces of equipment reveals the make-up and strength of a typical RED HORSE squadron. Left: In a project at Eglin AFB, Florida, personnel of the 823rd CES position giant concrete blocks for an actual aircraft shelter headwall. Right: 823rd CES site developers verify shelter alignment at Eglin AFB.

At the height of the Vietnam conflict, there were seven squadrons in the Pacific theater plus a training unit, the 560th Civil Engineering Squadron (CES), in Florida. **Figure 1** shows there were five squadrons in Vietnam, one in Thailand and one in Korea. These units had supported Air Force operations from Kunsan to Binh Thuy; but with their prodigious rate of accomplishment, after four years they were beginning to work themselves out of a job. In mid-1969, a decision was made to withdraw some RED HORSE units to adjust to the reducing workload. The 556th CES in Thailand was the first to go. By the end of 1969, the Triple Nickel Squadron, the 555th CES, had also been deactivated. The 557th CES left Korea in 1969, the 819th and 820th CESs departed in early 1970 and the 823rd CES was deactivated in mid-1971. This left only the 554th CES which currently is assigned to Headquarters PACAF.

A study conducted at the request of the Secretary of Defense during the early build-up in SEA showed that when national interests are involved and tactical forces are deployed without a declaration of national emergency or war, a quick-acting heavy repair force organic to the Air Force, and responsive to Air Force commanders' needs, was essential. This study was foremost in the minds of top civil engineers as RED HORSE squadrons left SEA.

By arguing that the value of RED HORSE for

future contingencies could surely be no less than for the Vietnamese contingency, proponents of RED HORSE were able to demonstrate the value of retaining RED HORSE in the peacetime environment. So, in early 1970, for the first time in history, the Air Force had in-being organic heavy repair units designed for contingency support but . . . with no contingency at hand. The establishment of the 557th CES at Eglin AFB, the 820th CES at Nellis AFB and the 819th CES at Westover AFB had ushered in a new era in the short history of RED HORSE. The question then was, "How best to employ RED HORSE in the CONUS?"

Few Realized Full Impact

Few people, if any, realized the full impact of the question at that time. Since units had returned to the United States without men or equipment, the first order of business was to rebuild. In 1966, units were put together from scratch in a few months. However, in 1970, the conditions created by tight budgets, lack of priority manning and other stateside factors caused the CONUS squadrons to differ considerably from those designed for SEA. Equipment eventually provided had seen up to four years of wear in SEA, personnel assigned were frequently at the 1 and 3 skill levels and dollars to repair equipment and train personnel were difficult to obtain.

But, perhaps the greatest difference between squadrons built for SEA and those reconstituted for post-SEA was conceptual. True, squadrons were still intended for contingency support. However, the nature of the contingency in SEA was known whereas the nature of those to come could only be surmised. Because of this and the shift in basic US political doctrine which had occurred, it was necessary to update concepts for the use of RED HORSE.

One of the fields which has become increasingly important to AFCE is base development contingency planning in support of Joint and Service operations plans. Although these cover as many possible eventualities as can be envisioned, the work does not stop with the writing of a plan. A flexible force is needed to implement the plan. Consequently, AFCE planners have reviewed the various contingency plans and have included RED HORSE wherever appropriate. RED

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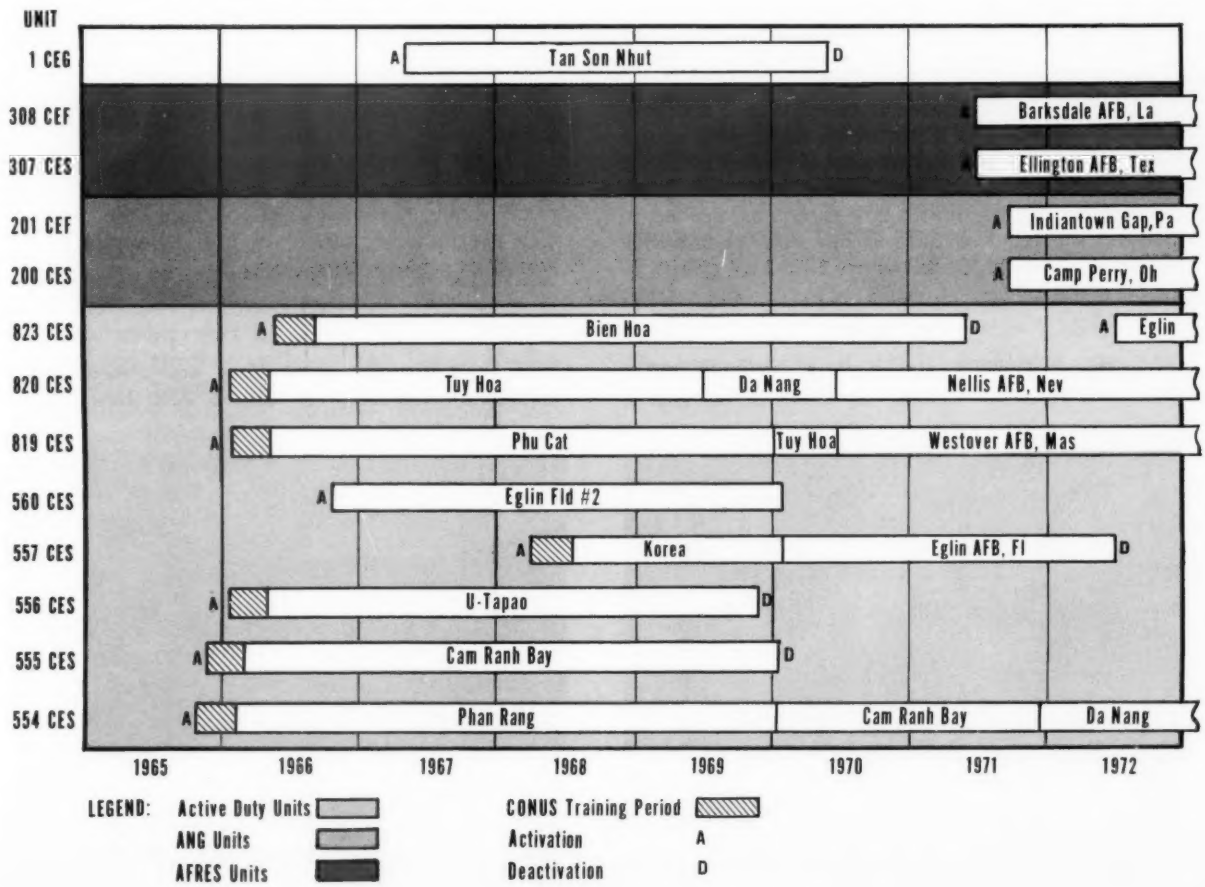
Figure 1: History of RED HORSE Squadrons.



The HORSE *cont'd*

HORSE operators in turn have reviewed plan requirements and are training and preparing accordingly.

Despite the high priorities for shipment, the movement of RED HORSE squadrons to SEA consumed a great deal of time. After the signal to move had been given, it was frequently 90 days before heavy equipment reached Vietnam. Present day concepts of warfare require rapid deployment of tactical air power with little or no advance notification. Yet, the requirement for heavy repair support forces in-theater still exists and many plans call for RED HORSE by name. Consequently, to provide a civil engineering heavy repair capability as responsive and quickly deployed as the tactical aircraft they support, two echelons within each RED HORSE squadron were created.

Advance Party Plans Work

The first echelon, called CES-1, is comprised of 14 personnel and is the advance party needed to plan the work, lay out the site and identify specific requirements and priorities of work for the follow-on echelon. CES-1 consists mainly of site developers, equipment operators and supervisors which are on alert to deploy by air within 12 hours after notification.

The follow-on echelon is called CES-2 and contains 81 personnel in a variety of skills, with equipment operators being predominant. Included in CES-2 are some 46 items of heavy equipment plus tents, generators, lighting units, spare parts, etc., needed to perform the required tasks. While each contingency situation is unique, tasks which CES-2 is geared to perform include limited airfield earthwork and grading essential to conduct of safe flying operations; installation of aircraft arresting systems; installation of essential NAVAIDS; provision of fuel and ammunition storage revetments; installation of power plants and utility systems; and repair of enemy inflicted damage.

CES-2 Is Air Transportable

The unique characteristic of CES-2 as opposed to previous RED HORSE concepts is that this echelon is air transportable. The vast majority of equipment can be deployed by C-130/C-141 aircraft and the outsize items deployed by C-5A. CES-2 is on alert to deploy within 72 hours after notification and squadrons have demonstrated their ability to meet this requirement.

The capability afforded by CES-1 and 2 enables RED HORSE to deploy rapidly and perform tasks required during the initial phase of contingency operations. However, in the event that the contingency is likely to be prolonged, CES-1 and 2 must be supplemented.

The balance of the RED HORSE Squadron is called CES-3. This echelon contains the capability to perform heavy repair and facility expansion on a sustained basis such as was required in SEA. CES-3 is prepared to deploy by surface within 10 days after notification and is designed to accomplish tasks such as: erection of hardened aircraft shelters, erection of modular relocatable facilities, provision of more permanent utility systems and facilities, etc.

In the peacetime environment, it is necessary for squadrons to be able to deploy anywhere in the world should the need arise and to do the job once they get there. A variety of training programs are geared to achieve these goals.

A cat-train plows through the snow, towing 20-ton sleds loaded with material to Blair Lakes, Alaska.

Pre-fabbed aircraft shelter rings are placed in the field awaiting erection at Kirtland AFB, New Mexico.

Deployment training is accomplished by constantly rehearsing the steps which must be taken to move men, material and equipment from the squadron area to the flightline. Mockups of C-130 aircraft made of concrete and steel are used by equipment operators to practice loading and unloading. Field exercises are conducted to practice packing, unpacking and repacking. Comprehensive deployment plans are written and rewritten as each exercise teaches a new lesson and as new techniques are devised. Detailed loading planning is accomplished and then studied to insure that related equipment items are on the same aircraft and that equipment needed first is on the first sortie.

Employment training is accomplished through OJT, GMT and other means to upgrade personnel in their skill areas. In addition, unit training programs have been instituted to provide the special qualifications required by RED HORSE personnel. These programs include unit security training, use of explosives, weapons firing, convoy tactics, perimeter defense training and others.

Projects Help Develop Skills

The primary means of providing employment training, however, is by accomplishment of civil engineering projects which develop skills similar to those which may be required during a contingency. These projects normally originate with a using agency such as a Base Civil Engineer (BCE) and are approved and assigned by the major command or numbered Air Force, if so delegated. The aspect of most importance is that accomplishment of these projects by RED HORSE provides a useful required facility for the Air Force user while, at the same time, obtaining valuable unit and individual skill training for the RED HORSE Squadron.

Projects are accomplished not only within the squadron's major command but other commands as well. One such project is construction of an aircraft bombing and gunnery range at Blair Lakes, Alaska. This project consists of clearing 1,200 acres of forest, construction of personnel quarters, operations and maintenance buildings and erection of observation towers 40 feet in height to provide a standard range for use by tactical aircraft from Alaskan Air Command and other commands.

This project was assigned to SAC's 819th CES at Westover AFB. The primary benefit to be derived by RED HORSE is experience in arctic construction operations. For, while RED HORSE has had ample experience in warm climate construction, except for some work in Korea, cold weather operations have been limited. The project was even more challenging because the site is isolated and accessible only by helicopter or by forging a trail over the frozen tundra. The 819th CES did precisely this to bring in the heavy equipment and supplies. Additionally, since the trail was not traversable unless frozen, the cat-train (caravan of dozers towing sleds) which was assembled, had to make the 72-mile trek during January, the coldest time of the year. However, working at temperatures down to minus 40 degrees Fehrenheit, the 819th CES took two cat-trains in, established the base camp, cleared the land and are currently building the permanent site facilities.

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The 557th CES at Eglin AFB was redesignated as the 823rd CES on 1 June 1972. It is in the process of completing construction of a unique shelter complex at Eglin Field No. 7. This complex consists of four precast concrete aircraft shelters, eight earth dummy shelters, and a 3,500 foot taxiway, all of which will be used as a test site for live firing of new weapons systems such as the Maverick Missile. The excavation, hauling and placement of 75,000 cubic yards of Florida sand was a challenge to the equipment operators but routine compared to the task faced by the structural specialists. They had to build block walls using precast concrete blocks weighing 3½ tons each. This feat must surely go down as one of the greatest bricklaying jobs since the pyramids.

RED HORSE is well known for the nearly 400 hardened aircraft shelters erected in Vietnam. Today, however, RED HORSE is building wide span shelters

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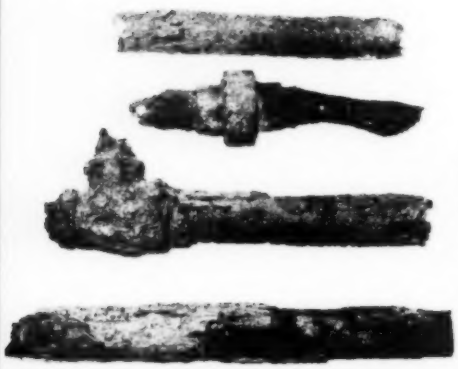
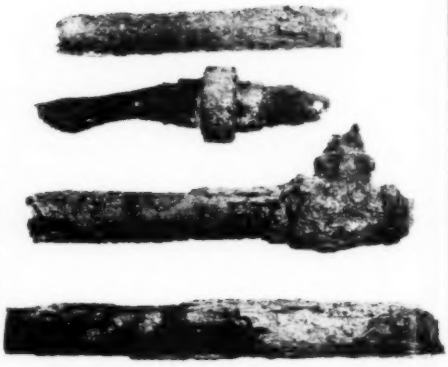
The vast majority of civil engineering equipment can be deployed by either C-130 or C-141 aircraft.



Corrosion costs the Air Force from $10 to $85 million annually . . . no one seems to have responsibility for avoiding its unwanted effects . . . it can be called . . .



The Forgotten Phenomenon

by Maj Louis G. Jamar, PE

There is in nature a forgotten phenomenon. Forgotten in the sense that it is rarely taught in common engineering curricula, despite the fact that in the engineer's world it is as inevitable as gravity and as ever present as water. Forgotten in the sense that its most serious effects usually occur in hidden, out of the way places. Forgotten in the sense that no one seems to have responsibility for avoiding its unwanted and sometimes serious effects. This forgotten phenomenon is corrosion.

The cost of corrosion has been presented in numerous articles and books. Corrosion is usually estimated to cost about $10 billion per year in the United States and from $10 to 85 million per year for Air Force real property. The derivation of these costs is not usually detailed, but repair and replacement costs are frequently mentioned. Other categories such as increased maintenance, product loss, down time, decreased system life, etc., are sometimes included also. Less easily estimated effects like decreased efficiency, lower reliability, reduced safety (gas lines), lower quality (machine tool output), etc., may or may not be included in the totals. Regardless of how they are derived, the validity of these estimates appear to be well supported, and the amounts involved are certainly substantial.

Cost Put in Perspective

The cost of corrosion can be put in perspective by realizing that a complete air base, Tuy Hoa AB, Republic of Vietnam (Project Turn Key), was built for about $55 million. Or think of the miracles that even the lower estimate ($10 million) could work on any base.

Whatever the amounts or methods of derivation, whether the country wide or Air Force costs are being considered, the extra dollars continuously being spent because of corrosion are paid by everyone. Industrial costs are paid through higher prices for goods and services purchased and, frequently, through decreased product quality. Air Force costs are paid through higher taxes and, for Air Force employees, increased workload. Since everyone pays the cost, it seems reasonable that many people should also want to know what makes these expenditures necessary.

Lack of Awareness Is Real Cause

In the technical sense, corrosion is caused by an electro-chemical process, a corrosion cell. But the practical causes are much easier to understand and perhaps more important to realize. Corrosion cells would never develop if it were not for poor design, careless construction, and haphazard maintenance practices; however, neither are these the root causes. The real causes are a lack of awareness, understanding and sense of responsibility for corrosion among our engineering, maintenance and management people.

Each base has a designated corrosion engineer. This responsibility is assigned to an electrical, mechanical or other engineer as an extra duty. Corrosion experience among these people is generally low and the turnover rate high, resulting in a limited professional capability. Adding the time constraints inherent in extra duty assignments, it can be seen that the potential of this program is rather severely limited.

The main thrust of the base corrosion engineers has been in correcting existing problems, along with some review of plans and specifications for a few projects. Many of the bases have made an excellent start, and some individual efforts have been outstand-

ing. The efforts of the Civil Engineering Center's corrosion survey team and the Civil Engineering School's corrosion consultant have significantly expanded overall capabilities and made major contributions to the program. However, it seems doubtful that this approach and level of effort will get the corrosion problem under control. Something more is needed.

What is needed is an appropriate level of awareness among all of our people. This is easily defined, but much more difficult to achieve. The need can be approached from many different directions and on many different levels; but perhaps the most effective approach is through educational programs, which can attack all facets of the need at once.

Educational Programs Available

A wide variety of educational programs are already available. Among them are: the two week Corrosion Control Course taught at the Civil Engineering School; the National Association of Corrosion Engineers sponsored courses (such as the three day Appalachian Underground Corrosion Short Course or their correspondence courses); and the major command sponsored conferences and workshops. Civil Engineering squadron-wide briefings and seminars on corrosion are other possibilities.

In any of these educational opportunities the base corrosion control engineer should have top priority, that is, unless his educational requirements have already been reasonably well satisfied. The second priority includes a much larger group of people, but the need for education among them is almost equal in urgency to the need of the corrosion engineers. This group includes the engineering, maintenance and management people who do the things and make the decisions that cause the corrosion problems. The only real hope for reducing the amount of money spent on corrosion control is through the reduction of design, construction and maintenance mistakes which cause corrosion. One part-time problem corrector is not likely to be able to keep up with the tens or hundreds of corrosion problem generators on a base.

Reality Increases Urgency

There is another reality which increases the urgency of educating people other than the corrosion engineer. It does little good to educate a corrosion engineer, only to send him back to a base where his superiors and fellow workers lack an appreciation for corrosion and its resulting problems. It is like teaching him to run faster with his head held lower so he can hit the proverbial brick wall harder. The same effect has been noted in teaching management courses. Good management must start at the top. The same relationship holds in corrosion control. Therefore, if any real cost reduction is to be made, the other people in the Base Civil Engineer organization must be aware of, understand and take responsibility for corrosion control. And the first step toward this end is to get these people educated.

MAJOR JAMAR *is currently pursuring his doctorate degree in industrial engineering at Ohio State University. He earned his bachelor's degree in metallurgical engineering from Michigan Technological College and his master's degree in industrial engineering from Texas Technological College. He is a registered Professional Engineer in Ohio. He recently completed a four year assignment as instructor at the Civil Engineering School, Wright-Patterson AFB, Ohio.*

Looking at the larger picture, there is an apparent need for our engineering educators to re-examine their curricula with respect to corrosion. Corrosion is a natural process that is for metal as inescapable as gravity. The inclination of metals to return to their natural oxide status is irresistible. Despite the inroads of non-metallics in recent years, especially plastics, huge quantities of steel and other metals are still consumed in engineering processes every year. From the cost estimates given previously, generous portions of these metals are wasted to corrosion within a short time of their original use.

Engineers Are Responsible

The people responsible for the items produced from these huge quantities of metals are largely engineers. Civil, mechanical, electrical and metallurgical engineers as well as architects all get involved. In fact, there are very few engineers who don't have a rather significant involvement with metallic structures, devices, etc., sometime in their careers. Yet how many of these engineers have had a course, or even a few hours of instruction, in corrosion control?

Effective Measures Are Available

Corrosion control technology is surely not one of the most advanced technologies in the engineering world, but effective measures are available to handle the great majority of today's problems. Great strides have been made in cathodic protection, protective coatings and water treatment; and the technology in these areas is well enough defined and organized to provide material for a college level or even graduate level course. This is the practical, applied kind of technology that engineering is supposed to be all about. Considering the fundamental nature of corrosion and the large sums of money in the balance, it certainly appears that a greater effort could be made in teaching our engineers corrosion control. Without some additional educational effort, corrosion will surely remain a forgotten phenomenon, but the cost of corrosion will become increasingly more prominent.

CE

. . . to fill a few voids in the BCE's knowledge of Rapid Setting Cements

by L. E. Pendergrast, PE

As a result of research by the Air Force for materials which lend themselves to expedient airfield pavement repair applications, such as bomb damage repair (BDR), practically every cementious material that exhibits quick-setting, high early strength characteristics has been subjected to study. Even though some of them have been marketed with unfamiliar sounding names, the rapid setting cements are generally the same materials we have known about and may have used for years. The particular cements in the class of cementious materials mentioned in this article are either gypsum, aluminous or Portland cements, depending on the raw materials used in their manufacture.

This presentation was prompted by a number of inquiries to the Civil Engineering Center concerning the properties and characteristics of certain brand name cements used in BDR and other quick repair applications. It is not intended as the "book" on rapid setting cements, but it may serve to fill a few voids in your knowledge of this particular group of cementious materials.

GYPSUM CEMENTS

The fast setting, high early strength properties of gypsum cements make them ideally suited for use as expedient pavement repair materials. Slurries or mortars made with gypsum cements can be rapidly mixed and placed, require nominal finishing and usually gain strength so quickly that the repair area can be opened to traffic in a very short period of time.

Manufacturers of gypsum cements have developed repair methods which exploit the properties of their products; to date, these methods have been principally employed by state highway department maintenance crews in small area applications as a temporary or semi-permanent fix for rigid pavements subjected to a high density traffic. Air Force experience in the use of gypsum cements has been oriented toward rapid BDR, which has incorporated special equipment and techniques to place large quantities of gypsum slurry in a very brief time interval (Fast Fix).

The gypsum cements are basically experimental products. Not too much is presently known about their durability, wear resistance and workability in concrete mixtures except that which the manufacturers have published. Although the projected high early strength of gypsum cement mixtures is a fact, some samples taken from Fast Fix applications have shown a propensity to absorb moisture from the air and deteriorate rather rapidly. Strength loss may be as much as 3000 to 4000 psi (compressive) in less than a year. Susceptibility of the gypsum cement mixtures to freeze-thaw cycling is now under investigation; it appears, however, that unless these mixtures are air-entrained, they become more vulnerable to freezing and thawing than conventional Portland cement mixtures.

Durability of the product is a prime requirement for Air Force applications which involve repairs to operational airfield pavements. Though the repairs may be quickly performed to minimize runway downtime, the effort may subsequently be wasted by early failure of the repair material. Therefore, the use of gypsum cement mixtures should not be recommended until there is assurance of the durability of the products.

One other disadvantage of gypsum cements is their high cost. Cost per cubic yard ranges from about $50 for a 1:2 gypsum cement mortar up to approximately $150 for a neat slurry. For purposes of comparison, the price of conventional concrete mixtures is approximately $25 to $40 per cubic yard depending on the quantity requirements.

ALUMINOUS CEMENTS

Aluminous cements differ considerably from other cements in manufacture, chemical composition and physical properties. The raw materials used in manufacturing aluminous cements are bauxite and limestone rather than the argillaceous and calcareous ingredients which are typical of Portland cements. As the term implies, aluminous cements have high alumina content and low lime and silica quantities. Physically, these cements are characterized by dark color, very high early strength, high heat of hydration and considerable resistance to chemical attack.

The properties of this class of cements can be exploited in producing concretes of superior high early strength, and because of accompanying high rate of heat evolution during hydration, the materials make excellent concretes for cold weather construction. Provided that certain parameters are controlled

in the placement and curing processes, aluminous concretes can be effectively used in expedient pavement repair applications.

Aluminous cement concretes should not be placed when the ambient temperature is above 90 degrees and considerable moisture is present (high relative humidity). Concrete placed under these conditions can be expected to show a dramatic loss of strength within about a year. Also, unless curing includes continuous wetting for the first 24 hours, heat evolved during hydration of the cement will not be dissipated; the concrete will develop shrinkage cracks and ultimate strength of the product will be reduced.

Cost of aluminous cement is approximately double the cost of Type I Portland cement. Proportioning of concrete mixes with aluminous cement involves about the same cement content as for standard concretes. Therefore, the anticipated cost of aluminous cement concretes per cubic yard would be about twice the cost of an equivalent PCC, or in the range of $50 to $100 per cubic yard.

REGULATED SET PORTLAND CEMENTS

Regulated Set Portland Cement (RSPC) is a recently developed cement which, according to the manufacturer, "is a fast setting Portland cement with the ability to gain strength at a rapid rate during the early ages of the concrete." Its composition differs from normal Portlands only in the chemical replacement of tri-calcium aluminate with calcium alumina fluorite during manufacture; in the hardening process, calcium fluoride precipitates out, and the hydration of the cement then follows generally the hydration pattern of a standard Portland cement. Concretes made from RSPC have the same basic characteristics as normal Portland cement concretes except that RSPC concretes set quicker and achieve higher early strength.

Recommendation for Mix Given

When RSPC concretes are used as fast-setting materials for pavement repair, the mix design should be about 7.5 to 9 sacks per yard. The manufacturer recommends this rich mix to offset the effects of severe early age use and provide quick set with long range durability. In other words, by increasing the cement content of the mix, reducing the water-cement ratio, and increasing the mix temperature, the setting time is reduced and the rate of strength gain is increased. This is true for basically all cements; the richer the mix, the quicker it sets, and overall quality of the concrete is improved.

The manufacture of RSPC incorporates high quality bauxite as a source of alumina; this is an expensive process which adds to the cost of the

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Figure 1: Properties, Costs and Availability of Gypsum, Portland and Aluminous Cements.

CEMENT Types & Brands	TYPE OF APPLICATION	INITIAL SETTING TIME (Minutes)	FINAL SET WITHIN (Hours)	TRAFFIC PERMITTED WITHIN (Hours)	24-HOUR COMPRESSIVE STRENGTH	PROJECTED DURABILITY	$/CY IN-PLACE	BULK AVAILABILITY
GYPSUM CEMENTS								
"Duracal"	Neat Slurry	23 - 35	0.75	1.5	10,400	Good*	140	
	1:1 Mortar	23 - 35	0.75		9,175	Good*	84	
	1:2 Mortar	23 - 35	0.75		7,250	Excellent*	61	
Hydrostone Super-X (Fast Fix Tests)	Neat Slurry	20	0.5	1	6,850	Fair		
ALUMINOUS CEMENTS								
"Lumnite"	1:3 Mortar	12	2	N/A (Test)	4,650	N/A	N/A	N/A
	Concrete 1:2:4 Typ	25	6	24 (req'd cure)	4,000 (minimum)	Excellent (with air)	56	Bag Bbl Bulk
PORTLAND CEMENTS								
Regulated Set	Concrete 9 sacks/yd	20	0.5	3	3,500 (estimated)	Excellent* (with air)	85	Bag** Bbl** Bulk**
Type III (High Early)	Concrete 1:2 Typ	20 - 45	10	24	2,750	Excellent (with air)	30	Bag Bbl Bulk

*Manufacturer's Claims **Available only at some plants

Rapid Setting Cements *cont'd*

product. Consequently, at the plant, RSPC costs considerably more than conventional Portland cements. In order to achieve the fast setting, high early strength properties desired, it is necessary to use more RSPC per yard of concrete, which again increases the cost per cubic yard in place. The resultant cost is approximately three times the cost of a typical PCC, or in the range of $75 to $150 per cubic yard.

All of the cements previously discussed have two common properties: they set rapidly and achieve high early strength. The major differences in these cementious materials become apparent in the way that they are applied, the chemical reactions which occur during hydration, the amount of material required to produce the desired properties, and subsequent durability of the product. Cost of the cement in a particular application (that is, slurry, mortar or concrete) has to be a major factor.

Durability Cannot Be Assured

In the case of cementious materials for rapid pavement repair, such as slab replacement, the class of gypsum cements should be ruled out. The application technique requires special equipment which is not usually available at base level, and cost of the material in a neat slurry or sand mortar is very high. Durability of the slurries and mortars cannot be assured unless air entraining agents are employed in the mix and even then, pastes and mortars are normally more susceptible to weathering than concretes.

Aluminous cements fall into a rather special category because they are neither gypsum nor Portland based. They differ radically from other cements, beginning with the raw materials used in the manufacturing process and ending with the curing of concretes in place. Aluminous cements, when properly applied in concrete mixtures, have excellent characteristics which can be best exploited in cold weather construction, but their use is not restricted in that sense, except in tropical areas; they are susceptible to the effects of high humidity and continuously high ambient temperatures. Concretes made with aluminous cement usually exhibit good, long-range durability and resist weathering. They initially develop high strength and maintain this characteristic throughout their service life. As indicated by the performance of aluminous cement concretes in the runway repair projects at Yokota AB, Japan, this is one potential application of the material. (See February 1970 issue, **Air Force Civil Engineer**). However, further evaluation of this application is required to be certain of the durability and performance under load of aluminous cement concretes.

RSPCs and high early strength Portlands (Type III) are very similar materials; only minor changes in chemical composition differentiate RSPC from other Portland cements. Of course, it is this singular difference which induces the rapid set, high early strength characteristics of the RSPC. It is possible, by varying the cement content of any concrete mixture, to produce variations in setting time and early strength, and it is indicated by the manufacturer's recommendation that an RSPC concrete must be very rich in order to achieve these desirable properties. The cost of this special cement, plus the quantities required, limit its use.

Standard Cements Are Simplest

Standard high early Portland cements are presently the simplest to use and still achieve quick set, high early strength properties in the concrete. One day compressive strength of Type III concrete (2750 psi) does not approach the high early strength of an aluminous cement concrete, but this initial strength is usually adequate for most of its construction applications. In lieu of extensive curing operations, the fresh concrete can be sprinkled with a curing compound and kept moist with conventional techniques. Type III PCC should not be opened to traffic in less than 24 hours unless accelerators have been added to the mixture during placement. But again, this procedure should be sufficient for most operations. Cost of the high early strength Portland cement is slightly more than standard Portland, and is generally available through any cement distributor. Expressed in dollars per cubic yard of concrete in place, cost of high early strength concrete would be on the order of $30 to $55 per cubic yard.

In the final analysis, the choice of which of these products to use in a specific application depends on what you want the material to do. Selection can be influenced by many factors, such as the criticality of the area to be repaired, availability of materials and equipment, costs, and type and permanency of the repairs to be accomplished. We hope that by disseminating this information about rapid setting cements, it may make the process of selection a bit easier.

CE

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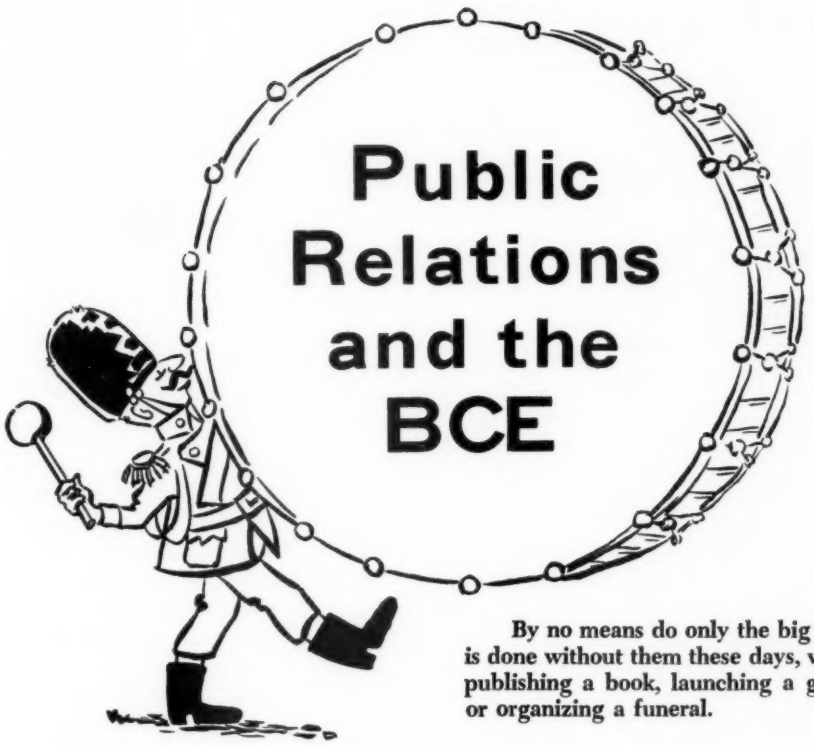

By no means do only the big chiefs use p.r. men: hardly anything is done without them these days, whether one is starting a barbershop, publishing a book, launching a girl in society, arranging a wedding or organizing a funeral.

by Capt Robert A. Kunselman

After reading the above, the Base Civil Engineer (BCE) may ask himself, "Can I use public relations?" Why not? Public relations is an arm of management that can serve the BCE just as it does the "big chiefs!" This paper will investigate the use of public relations by the BCE to enhance the normal operation of his business. It is believed that an applied public relations program can aid the BCE in accomplishing the numerous and varied tasks for which he is responsible. A description of the BCE's job will be covered, followed by a discussion of public relations. Finally, suggestions will be offered on how the BCE may incorporate a public relations program into the management of his organization.

Letting Base Population Know

In hindsight, the writer realizes he failed to capitalize on several opportunities to let the base population know what was being done to enhance their lives in the Air Force. This included several maintenance projects in the housing area, and some of the improvements to the heavily used facilities on the base such as a project to improve the flow of commissary traffic into and out of the parking lot. If these projects had been handled properly, the people would have actually seen what was being done for them. Their hostilities, due to inconveniences during the working stage, could have been minimized and tempered with understanding through an applied program of public relations.

A description of the BCE's job is similar to that of a City Engineer. Briefly, the BCE is responsible to the Base Commander, just as a City Engineer is responsible to the Mayor, for the maintenance, operation, alteration and construction of real property facilities. Thus, the actions by the BCE organization affects many people. Consequently, it is advantageous for the BCE to have a public relations program as an integral part of the normal operation of his organization's business.

To begin a discussion of public relations, it is best to first explore the basic guideline for those working in public relations – "Do unto others as you would have them do unto you." Keeping this in mind, one definition of public relations is " . . . the business of working with and for the goodwill – to sell a product, an idea, or a system." A helpful formula for conducting "the business of working with and for goodwill" is remembered by the acronym, RACE (Research, Action, Communication, Evaluation). When a need to "sell a product, an idea or a system" arises, the four steps of this formula can help to successfully achieve this end. A brief discussion of each of these four steps follows.

Research identifies what problems or needs exist. The first step in solving any problem or in completing

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Public Relations *cont'd*

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any project is to define the problem or the goal of the project. Research helps to identify the problems or needs.

Action is based upon what research reveals. By knowing the problems or needs, the necessary actions can be taken. Consequently, actions are based upon sound reasoning and are thereby meaningfully directed. Once action begins, an organization is saying something either with words, through action, or both.

Communication has two necessary characteristics to be effective: what is said and how it is said. After formulating the public relations program, it must be carried out in a language common to all. If unique terms are used, these should be explained. People do not want to be bombarded with extraneous material that can inhibit understanding of the main message. Consequently, simple, clear and understandable messages are preferred. Furthermore, whether communication is words or actions, it is very likely the message will be passed on by those receiving it. Hence it is important to talk in a language that everyone will understand so that the true meaning is conveyed.

Evaluation reveals what the program has done. Possible shortcomings in the program are realized and they can be corrected. Also the actions receiving good response may be increased. Thus, good evaluation reveals what needs to be altered, while ineffective evaluation may direct much effort in the wrong direction.

Formula Helps BCE Maintain Rapport

The successful application of the RACE formula can help the BCE maintain good rapport with the people who see and feel the effects of his organization's work.

At this point, it is essential to consider what is meant by the term public. One definition is that " . . . a public may . . . exist whenever a group of people is drawn together by definite interests in certain areas and has definite opinions upon matters within those areas." The BCE must realize that two general classifications of publics exist: the internal and the external. His internal publics are the employees in his organization and his external publics are the people his organization serves. Much of his public relations effort should be directed toward his employees since the BCE organization is judged on the performance of the employees by the external publics. Employees with high morale will reflect well upon their organization.

One group of employees that should be considered is the workers. An effective method of communications with them is through a squadron newsletter. It must be formulated, planned and carried out with emphasis from the BCE himself. Otherwise, an internal publication cannot serve its purpose. Many potentially useful publications of this type falter because of the lack of support by a commander. With imagination, meaningful articles can be written to inform the workers that their work is appreciated. Further, if workers know what is going on in their organization, the more they will feel a part of it. The data in **Figure 1** strongly supports the usefulness of an internal publication in conveying appreciation to the workers and in informing them on what is happening.

Image Created by Workers

Since the external public has more contact with the workers than with the foremen because the workers actually perform the tasks, the organization's image is created moreso by what the workers do than by any other group of employees in the organization.

Turning to external publics, this discussion will consider the base population to be an external public. Areas that the BCE may want to explore for the development of a public relations program aimed toward the base population are the following:

- Personal Appearances: At various meetings on the base, the BCE can present the positive side of his organization, and cover specific items of interest such as work projects which disrupt those personnel living on base (family housing maintenance projects), and

Figure 1: How Foremen & Workers Rate Job Conditions:

JOB CONDITIONS	WORKER RATING	FOREMAN RATING
Full appreciation of work done	1	8
Feeling "in" on things	2	10
Sympathetic help on personal problems	3	9
Job security	4	2
Good wages	5	1
"Work that keeps you interested"	6	5
Promotion and growth in company	7	3
Personal loyalty to workers	8	6
Good working conditions	9	4
Tactful disciplining	10	7

those personnel who live off base (projects which disrupt traffic routes to work and those that disrupt parking areas).

• Use of On and Off Base Information Offices: Working with the Base Information Office, the BCE should use the press to keep the base informed about approaching projects that will cause temporary inconveniences. Also, progress reports on lengthy projects should be publicized so that the base population will know there is an eventual end to the inconveniences encountered. When using the newspaper, radio or television, the positive side of the picture must be emphasized: let people know what the new facilities are doing for the base population.

• Projects "On the Shelf": The BCE should keep some public relations projects "on the shelf" and ready to go when funds are available. These projects could include playground improvements, landscaping and other items that enhance the base and living areas.

BCE Should Remember Suppliers

Another external public the BCE should consider are the suppliers who would appreciate knowing ahead of time about any special problems related to reaching the delivery points on base. The smooth flow of large vehicles on and off base will help the normal flow of traffic on base.

The surrounding community is an external public the BCE should also consider since some projects might require the cooperation of community services or they might inconvenience members of the community. Again, an information program to tell the positive side of the project will lessen the sour feelings by those inconvenienced.

At this point, a BCE may ask, "Can a public relations program really work?" Perhaps the following examples may shed some light on the answer.

The City of Philadelphia conducts a grand parade and schedules a clean-block rally that attracts thousands of participants. Included in past parades have been refuse-collection trucks, fire trucks and similar equipment.

The City of Pensacola, Florida, holds a parade, and offers demonstrations of equipment to show citizens where their tax dollars go and to demonstrate how new and more efficient equipment is being used.

The National Clean Up - Paint Up - Fix Up Bureau sponsors an annual National Cleanest Town Achievement Contest. In 1967, San Antonio won the top award. Among the many things the city does to create interest is to sponsor "A Yard of the Month" contest which proves extremely popular.

These examples can easily be incorporated into a BCE program or they can initiate thinking that could lead to other areas of a public relations effort. Armed Forces Day is a natural to show the Civil Engineering story; the annual Spring Clean Up campaign is another. Planning well in advance for these events is essential. At a base, the involvement of key individuals with programs of this type will help, the same as it did for the cities.

In conclusion, the job of the BCE has been described briefly, public relations was discussed, examples of public relations programs illustrated, and the need for official backing documented. The BCE can plan and implement an effective Public Relations Program by adhering to the golden rule and following the RACE formula. Public relations is a continuous program, and it can help the manager. CE

The HORSE *cont'd*

to house the F-111 and similar sized aircraft. The 819th CES constructed 24 98-foot span unhardened shelters at four bases to house the FB-111, and the 820th CES at Nellis AFB is currently constructing two new prototype shelters for test purposes. One shelter at Kirtland AFB will be covered with concrete and equipped with an armor plate steel door to undergo destructive weapons testing. The other shelter is being constructed on the ramp at Cannon AFB and will be used to test operational compatibility with the F-111.

In addition to these major projects, CONUS RED HORSE Squadrons continuously deploy groups of 10 to 20 personnel to bases in Europe and Alaska as well as within the continental United States to improve alert crew quarters, install VASI systems, repair ranges and a multitude of similar tasks essential for RED HORSE training as well as productive for the BCE.

This is what has happened to "THE HORSE." CONUS squadrons still possess the punch they displayed so well in SEA, yet they have been improved to take on the added mission of mobility response. They train to deploy and employ in a manner which will best support current Air Force missions and future contingency plans. Yet in training to employ, squadrons serve the Air Force in two ways—by enhancing their own proficiency and by producing a useful facility.

So, even in peacetime, RED HORSE continues to perpetuate the traditions established by the "HORSEMEN" who went to SEA. It is to these men and those who have followed after them that we express our gratitude for being able to say "the HORSE is not dead." CE

Is progress judged by productive time on duties or on the results of such duties?

The E-M Concept: Luxury or Necessity?

by Lt Col Joseph A. Devlin

Touted as the panacea in Air Force Civil Engineering (AFCE) for several years, the Engineer-Manager (E-M) Concept remains an unrealistic goal that dissipates crucial manpower resources at base level by imposing superficial compliance for the benefit of management inspections. Although we have been struggling with the implementation of this concept for five years, the "band wagon effect" continues to extol the virtues of the E-M in our **Air Force Civil Engineer** journal while ignoring our inability to effectively establish the program.

Recently one of our Air Force Civil Engineering leaders stated that the acceptance of the E-M concept is one of the most vital challenges which we face in the ultimate realization of the AFCE mission. (See February 1972 **Air Force Civil Engineer.**) The implication is that we must apply professional engineering judgment to every dollar we spend. Certainly no one will question the goal of aspiring to validate our facility requirements with professional engineering judgment. Achievement of this goal would establish credibility all the way up to Congress in correlating the improvement or degradation of installations with funding levels. The E-M concept, however, must be evaluated by effectiveness, rather than purported goals.

Other Methods Must Be Explored

Presently our progress toward implementing the E-M concept is judged by the amount of productive time spent on these duties, rather than the results of such efforts. The judge, of course, appears in the form of the Inspector General (IG) who is less concerned with the requirements and limitations of a unit than the directives with which that unit must comply. Unfortunately impetus is supplied by the IG to the E-M concept in a negative manner. A typical deficiency noted by the IG is failure to fully implement the program because 25 percent E-M time had not been devoted to these duties. Such a comment infers that the base was shortchanged by civil engineering. The usual reaction, motivated mainly by the currently over-emphasized seriousness of a repeated discrepancy, is a frantic attempt to catch up on facility inspections and E-M validations to reflect appropriate compliance. The accompanying degradation in the quality of inspection and the disastrous effects upon design schedules are ignored. Cures of this nature are self-defeating. We must explore other methods of evaluation in order to judge the effectiveness of the E-M concept.

Let us review the part played by the E-M in the total programming process as presently defined. In the course of annual facility inspection surveys, planning technicians (PTs) identify requirements for maintenance and repair, then tentatively program their fulfillment over a five-year period. An E-M later inspects each facility; his technical judgment permits him to validate requirements and discover indications of significant deficiencies. These may demand further investigation and substantial resource allocation for their maintenance or repair. When all transactions between the PT and the E-M have been identified, documented, validated, collated and shaped into a program, we have a neat package of requirements programmed for a five-year span. To achieve credibility at higher levels, each element has been validated by a professional engineer. This credibility can be used as leverage to support requests for supply funds, additional manning or contract dollars.

BCE Must Survey All Talent

Although E-M duties belong primarily in the Engineering and Construction Branch, the Base Civil Engineer must survey all available talent to cope with the problem. Let us explore the potential for E-M throughout the organization to locate the necessary manpower. The Chief of Operations and Maintenance is usually the only engineer in that branch. In most cases he is overburdened without such additional duties. The officers in Programs are submerged in processing work requests, programming contract projects, keeping planning technicians on inspections schedules, fulfilling command interest requirements on special work requests, writing letters to Supply for materials which are long overdue, monitoring a complex cost accounting system, and determining budget status. Industrial Engineering rarely has more than one engineer assigned. He is the gadfly of civil engineering who also struggles with the base responsibility for the consumption and conservation of all utilities. Members of the Fire Department and our recently added Family Housing Branch do not have the engineering expertise for E-M duties.

This relegates the burden to the Engineering and Construction Branch. Within their responsibilities for design and construction management of projects by contract, the assigned engineers will somehow make 25 percent of their time available for E-M duties. In addition, the E-M will find time to maintain updated

utilities brochures, satisfy urgent design requirements of tenant units, estimate future MCP items, revise prior years' projects as necessary, estimate work requests for the FB, attend Traffic Safety meetings and Environmental Protection councils, provide the corrosion control and radiological protective factor expertise on the installation, staff Site Concurrence Letters from AFCS for supporting requirements of proposed communications systems, provide gold flow letters, and produce manpower justifications on service contracts. The E-M must also visit off-base sites to design and evaluate projects while simultaneously acting as the technical representative of the contracting officer on contractor operated sites. Unfortunately the technical expertise needed for E-M duties compounds the problem; it is not always available in proportion to demand. At base level, we often operate with neophytes in our several disciplines. Our turnover of officers is such that many of our E-Ms are recent graduates. Regardless of the depth of their engineering schooling, they do not have the experience to objectively analyze documented requirements made by planning technicians.

The primary difficulty in implementing the E-M concept, therefore, is the limited number of engineers to accomplish the validation of requirements. The immediate pressure of design schedules and a kaleidoscope of other activities force us to limit E-M duties, regardless of the time theoretically devoted to them in position descriptions. There is a fundamental error in the assumption that such a concept can be implemented with the manning established by the world-wide civil engineering manpower study. A review of the Strategic Air Command Manpower Evaluation Team (SAC-MET) Manpower Study of 1969 shows that the manning of engineering and construction branches was determined by two elements:

- The total number of square feet of floor space on the installation, and
- The total amount of contract expenditures. This appears to be a gross error in manpower determinants. Air bases which have similar amounts of square footage and contract expenditures may vary considerably in their E-M requirements. The age and condition of the operating systems as well as the facilities must be taken into consideration: central heating systems with miles of distribution lines versus individual heating units; base generation of power or purchased power; purchased water or wells with water plants; fuel storage as opposed to pipeline access; fuel distribution through an extensive hydrant system versus fillstands and a fleet of POL distribution vehicles; permanent construction in lieu of wooden shacks. Of course, the MET would suggest that these determinants are mere guidelines and the engineer must tailor his manning document to fit his installation. Additions, however, are most difficult. Manpower actions at this time of Air Force-wide reduced manning invariably require a zero sum net change to the Unit Detail Listing. Strengthening one area at the expense of another is not always acceptable; it would only be an expedient approach to solving the manning problem in Engineering and Construction.

Let us look at the reality of the situation. We have made an enormous investment in devising and implementing a logical system to identify requirements and to program their accomplishment. We find ourselves in the awkward position of demanding more time for engineers to validate more requirements despite the fact that they cannot even find time to design projects; furthermore, these projects constitute only a small portion of the previously identified requirements. We need a change. We need greater rewards for the expenditure of 25 percent of our engineers' time than additional validation of improbable projects. Our Operations Operating Budgets, year in and year out, do little more than permit us to maintain the installation in a minimum acceptable condition.

We Must Anticipate and Accept

No amount of documentation and validation, short of a dire emergency, appears to bring more than a proportionate share of funds to a particular base within a command. Our mission, which is mainly dictated by direct support areas will continue to receive the primary emphasis in civil engineering, regardless of the five-year program. We must anticipate and accept the reduced funding levels which are imminently before us and organize our manpower resources accordingly. The facilities reviewed by the E-M must be no less selectively chosen than projects forwarded to Headquarters U.S. Air Force for emergency funding; they should both meet specific criteria. PT inspections can be so organized that they illuminate problems which demand E-M validation rather than require annual percentage expenditures of E-M time on all facilities. We cannot logically expect increased funding for additional manpower or Architectural-Engineering services to free us for the performance of E-M duties. We can logically adjust the requirements that we place upon our E-Ms.

An adaptation of the E-M concept to actual capabilities is overdue. CE

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AFCE Leaders You Should Know

... Col Robert C. Thompson

Ask Col Robert C. Thompson what is the biggest challenge confronting Air Force Civil Engineering today and he quickly responds: "The need to do more with less." The words are not profound; they have been said before. But when he expands on the remark, the words are succinct:

"We need to place increased emphasis on management within AFCE. We need to determine what's important and what is not; what is priority and what is not. We need to focus on the objective; identify the obstacles and eliminate them. We must further develop the ability to lead, communicate, motivate."

Colonel Thompson is management oriented — no doubt a result of his experience as the Assistant and then Deputy Chief of Staff for Civil Engineering at 8th Air Force from January 1968 to April 1970, and then in the same capacities with 2nd Air Force from April 1970 to July 1971. By applying this first hand knowledge, he bridges the gap between the various activities under his guidance and the people who work for him — to the benefit of all.

Presently, he is the Deputy Chief of Staff for Engineering and Services, Headquarters United States Air Forces in Europe (USAFE), a position he has held since July 1971. He discusses his responsibilities with the assurance of a man who has complete control of the situation. They include the planning, directing and coordinating of the development and administration of policies and procedures pertaining to facility planning, programming, engineering, construction, maintenance, and acquisition and disposal of real property facilities.

In addition, he serves as the overall manager of family housing Class VI, and community services which include 59 dining halls, 30 commissaries, clothing stores throughout the command, three mortuaries and 52 Class VI stores.

To handle all of these responsibilities, he has over 9,670 employees who work in the command from the United Kingdom to Turkey. Also, the facilities in the command represent an investment of over $540 million, with a current replacement value of over $1.5 billion. The facilities are located on 27 major installations throughout Europe and there are over 425 auxiliary, off-base, detached units.

With such a staggering amount of responsibilities, there are problems. He describes his this way: "The single biggest problem in USAFE is the need to provide adequate civil engineering support to our commanders at every level, with the ever decreasing resources of money and manpower. The problem is not unique to USAFE. The lack of adequate resources creates an ever growing challenge to the AFCE manager."

But like all conscientious managers, he realizes what must be done. How can we do more for less? He responds:

"We need to improve work force productivity; manage our money better; improve and simplify management procedures; reduce paper work, red tape and reports; and increase our emphasis on management training. These are all measures we must consider in compensating for dwindling resources."

The Pennsylvania native began his military career in 1942 when he entered the US Army Air Corps as an aviation cadet. A civil engineer since 1944, he has both his bachelor's and master's degrees from the University of Maryland.

Colonel Thompson was asked what his reactions are to the future of Air Force Civil Engineering.

"I see a great future for AFCE. There will be increased acceptance and recognition of the civil engineer organizations as a priority operation in the scheme of things. There will be overall improvement in the civil engineer officer corps — men who are better educated, highly motivated, dedicated and career oriented.

"We will be blessed with a management corps which asks why we do things as we do and, if there is no sound logic for doing it the old way — let's find a better way. The status quo won't be good enough.

"Finally, the civil engineers of the future are going to be confronted with new and different problems and challenges; improving the environment; new changing sources of energy; new national attitudes and priorities; more changing engineer techniques."

Colonel Thompson too will be confronting the future with new and different problems. Sometime this year, he will replace the insignia of the eagle for that of a star. The promotion to brigadier general will bring added responsibilities and duties, which as his background dictates, will be accepted with the same degree of concern and enthusiasm as any position he has held.

"There is no particular high point in my career," he confesses, "as I have always enjoyed my association with civil engineering. I have never had a bad assignment and I have met wonderful people everywhere I have been. I have been fortunate."

Air Force Civil Engineering has also been fortunate. CE

The Air Force Civil Engineer and the Military Statesmanship Role

by Maj Robert M. Gogal, PE

Successes of great nations are generally attributed to the prevailing national leader. The accomplishment of these successes may well be guided at the national level of leadership. Notwithstanding the value of national leadership, such successes can only be achieved by the tenacious efforts of many individuals, among which, are those—who coincidence dictate—serve as military statesmen.

AFCE Wears Many Hats

The Air Force Civil Engineer (AFCE) of the 1970s wears many hats. If he is the senior civil engineer officer on an Air Force installation, he is more than likely both the Base Civil Engineer (a staff function) and the Civil Engineer Squadron (CES) Commander (a command function). The AFCE is also a resource manager, a function which has taken on an element of great importance with contemporary annual limited budgets. This function is one which is more commonly identified as the engineer-manager and associated with it is "that relatively senior military member, stationed in an overseas environment and professionally exposed or involved with local indigineous personnel. This military member is recognized by the indigineous personnel, formally or informally, as a representative of the military member's government."

There are certain important observations to make on the above definition. The military statesman is the **relatively senior member.** In many situations, he will be a Colonel or a lesser field grade officer. In certain other situations, he may well be a senior company grade officer or even a 2nd Lieutenant, if that officer is the senior member present. Being **stationed in an overseas environment** is not an uncommon occurrence for an AFCE officer; an average of three overseas tours in a 20 year career is not unusual. During the height of the Vietnam conflict in 1968, approximately 52 per cent of the AFCE officers were assigned overseas. In 1969, this number had reached almost 60 percent. In March 1972, even with the draw down in Southeast Asia (SEA), approximately 30 percent of AFCE officers were in overseas assignments.

Professional exposure and involvement with local indigineous personnel is a way of life for the AFCE officer overseas. Consider first of all that perhaps half or all of his work might be indigineous. It was not uncommon in SEA that most Civil Engineer Squadrons were composed of more indigineous personnel than Air Force personnel. In accordance with status of force agreements with the United Kingdom government, essentially **all** the civil engineer work force is indigineous at Air Force utilized RAF bases. Professional exposure or involvement with indigineous personnel is also realized through contract services and contracted construction. In some cases these contractors will be indigineous, while in other cases they will be U.S. In almost all cases, the contractor work force will be indigineous. Additional professional exposure to indigineous personnel is realized in land acquisition negotiations, the establishment of indigineous unions, and a host of utility associated questions, such as sewer outflow characteristics, utility acquisition rates when the utilities are furnished by the indigineous personnel, and so forth. The above is offered as argument that the AFCE officer, by the performance of his duties in an overseas area, does fall within this discussion's definition of the military statesman.

Role Is Important for Two Reasons

The role of the AFCE military statesman is important for two reasons: First, and perhaps most important, the AFCE military statesman is involved in international political relations between his government and the indigineous government. This involvement is generally informal. The AFCE officer is not an appointed representative of his government's current administration, nor is he a representative of the State Department; however, he is more often than not, the most prominent senior representative of his government that the vast majority of the local indigineous personnel will at that time have contact or association with. His conduct with and his attitude towards the indigineous personnel can influence their attitude in a positive or negative manner towards the U.S. The attitudes of these indigineous personnel will influence their local political leaders, and in turn, have some effect on their national political attitude towards the U.S. Simply stated, the AFCE military statesman must be cognizant of the ease with which he might foster

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Military Statesmanship

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or encourage the ugly American image and he must avoid it.

The second consideration is of a professional aspect. Sound management practices of today dictate the philosophy of people-oriented personnel management. Air Force managers are expected to know their personnel and to understand them and their needs. This expectation is to be applied to indigineous personnel as well as Air Force personnel. Consider the AFCE job at hand, the operation and maintenance of air base facilities. If an officer is to realize an efficient output of his work force, the support, cooperation and dedication of the total civil engineering force is essential. The question, concerning how one acquires the support, cooperation and dedication of the indigineous work force, is a difficult one to answer. Perhaps, the most honest answer is that there is no one single world-wide set of rules to apply and then realize such a level of personnel support, cooperation and dedication.

The military statesman, and the AFCE officer in such a role, should possess the normal characteristic of leadership

A tried and true rule of management is to consider the three variables: the manager, the environment and the workers, for each situation. After studying these variables, try to optimize the overall situation. It is important that an attempt is made to understand the indigineous workers and professional acquaintances, and the environment. Generally speaking, indigineous personnel will not adapt to U.S. work standards if the standards are alien to their way of life. It might be a Vietnamese two hour lunch period, the English tea time, the German practice of drinking beer at the office desk for lunch, or the strength of the Italian trade unions that irritate AFCE officers overseas. Generally speaking, any attempt to make inroads on these indigineous customs or occurrences will cause further irritation, alienation or loss of worker efficiency.

It is important to place the situation in its proper perspective. The indigineous work force assigned to an AFCE officer overseas is a small percentage of the immediate local population. The workers may be average or the most qualified, depending on the local economy. Nevertheless, they are the resources to work with, and a constraint that must be recognized by the officer. For instance, consider the Vietnamese two hour lunch period and the way in which it reduces efficiency in a CES operation. Whether the indigineous personnel are in the paint, carpenter, plumbing, electrical, or roads and grounds section, they will normally require transportation to and from the job. If the lunch hour is from 1200 to 1400, this may well mean that work will stop at 1130 and resume at 1430, allowing for transportation time. It will also mean probable non-productive time of some two hours for those Air Force supervisors or team workers with whom the indigineous were working.

The positive management approach of course would dictate that steps be taken to reduce the indigineous lunch hour to conform to the Air Force lunch period. Unfortunately, this usually is not a successful approach. Either the indigineous will resist such conformity, or if they do conform, their overall performance will not have shown a proportinate increase. A more realistic management approach would be to accept the two hour lunch period, reduce the level of supervisors and team workers to a minimum, develop an indigineous supervisory capability, and make transportation to the job site available only at times consistent with the Air Force work schedule. The result of such a course of action should be increased Air Force personnel productivity, job enrichment for certain indigineous personnel, and a subtle hint: ride with the Air Force work force or walk.

Empathy is essential when dealing with indigineous personnel. It must however be balanced with firmness toward Air Force personnel. This leads to the important element of harmony between the Air Force and the indigineous personnel within the CES. It can only be accomplished by education of Air Force personnel, proper administration of indigineous personnel, discipline of indigineous personnel when required, reasonably mixed work forces, and some level of squadron-wide social functions.

Air Force personnel should be made well aware that they are guests in the land of the indigineous personnel. They should know basic customs and local

taboos. Indigineous personnel will require administration and can be expected to require periodic disciplinary action. It is essential that this function be accomplished impartially and expeditiously, and if possible under the administration of a trusted and competent indigineous employee. Fair, honest and rapid treatment should reduce partiality suspicions among Air Force personnel, and inspire greater discipline among the indigineous personnel.

Squadron parties, where both indigineous and Air Force personnel attend, are excellent mediums to create harmony between the two work forces. Even greater importance can be attached to these functions, when the party is coincident with a national holiday, either US or indigineous. If it is Christmas, and the Air Force personnel sponsor a party to which the indigineous are invited, the indigineous personnel will feel honored and privileged in addition to being entertained. The same attitude prevailed among airmen in Vietnam, when invited by the Vietnamese employees to TET holiday observations. Harmony, although many times difficult to fully realize on the job scene, was generally easily achieved at the squadron party, as might be expected.

Empathy Cannot Be Developed

The military stateman, and the AFCE officer in such a role, should possess the normal characteristics of leadership, not the least of which are integrity, loyalty, decisiveness and communicative skills. In addition, the military statesman must have the following characteristics when dealing with indigineous personnel: empathy, understanding, interest and an awareness of his position. Empathy is a personal trait that a man has or hasn't. It cannot be developed or cultured. Understanding of the indigineous and their environment can be realized by study and by reading. There is a host of means available to develop this understanding. Interest in the indigineous personnel and environment can be developed and can be genuine. It is not spontaneous upon arrival in an overseas area, but results from involvement and participation with the indigineous. It is imperative that the interest be active and not be passive; it must be demonstrated for the military statesman to be effective. Finally the military statesman must always be cognizant of the reality that he is a **guest** in the indigineous land — irrespective of his rank, personal wealth or his association to the most powerful nation in the world.

Educate Yourself to Indigineous Nation

There is one basic recommendation to AFCE officers who are called upon to fill the role of the military statesman: **educate yourself with respect to the indigineous nation.** Study and read. Become aware of the nation's recent and contemporary history, political and military affairs. Know in some detail the current situation in the immediate local area to which you will be assigned. For the piece d'resistance, learn the local language.

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Obviously, several books written about the many nations of the world are available; no attempt will be made to recommend any of these. The following, however, is a list of publications and periodicals that are recommended as a means by which to become familiar with contemporary issues of nations or geographic areas.

- **Department of State Background Notes:** Published by the U.S. Government Printing Office, these are available for most of the countries of the world. They contain current references on the population of the countries, ethnic origins, national history, government, economy, foreign relations, U.S. and the national relations, and the names of principal party and government officials.

Key Economic Indicators Provided

- **Foreign Economic Trends:** Also published by the U.S. Government Printing Office, these too are available for most of the countries of the world. They provide key economic indicators, current economic situations and trends, and implications for the U.S.
- **Air University Library Index to Military Periodicals:** Published by the Air University Library, Maxwell AFB, Alabama, the index provides one of the most concise listings of periodicals on free world and communist military subjects.
- **DOD Pocket Guides:** Available for most of the countries that U.S. military personnel may be assigned to, these are brief and basic in nature.

AFCE officers are periodically called upon to serve as military statesmen, while performing civil engineering duties in overseas locations. The more prominent special characteristics required of the successful military statesman are empathy, understanding, interest and awareness of position. To prepare for the role of the military statesman, the AFCE officer must educate himself concerning the nation and the people where he will serve. To accomplish this, there are ample volumes and periodicals. CE

Headquarters EMPHASIS

■ Information contained here is provided by the various Divisions that make up the Directorate of Civil Engineering. Information is intended to keep Base level personnel informed.

MANAGEMENT DIVISION: AFM 85-1 which has been completely rewritten has been distributed to the field. Each BCE may begin implementation of the new procedures immediately. Full implementation is expected by 1 January 1973. The new manual is designed to provide the BCE with the maximum flexibility in determining the method of operation for his specific installation. . . . . The FY 1973 Management Review Program remains basically the same as the FY 1972 program. Necessary changes or modifications were implemented by updating the FY 1972 program. . . . . PLANT ENGINEERING DIVISION: An all MAJCOM letter established interim policy effective 1 May 1972 to delete testing and paint marking for those apron ground points accomplished since 1 May 1971. Only those grounds less than 10,000 ohms and actually needed to support mission requirements need marking. Those over 10,000 ohms will not be replaced, marked or used.

HOUSING DIVISION: Water beds impose floor loadings of 40 to 60 PSF, and may impose loadings approaching the limits of structural safety. Though structural collapse is not anticipated, plaster cracking from excessive deflections is possible. Occupants of housing units should be advised of their liability for potential damages. . . . . An increase of student spaces has been obtained for the FY 1973 Defense Family Housing Management Course. Open to officers and GS-7s and above, nominees from each base should be forwarded to the MAJCOMs for submission to and approval of AF/PRENB.

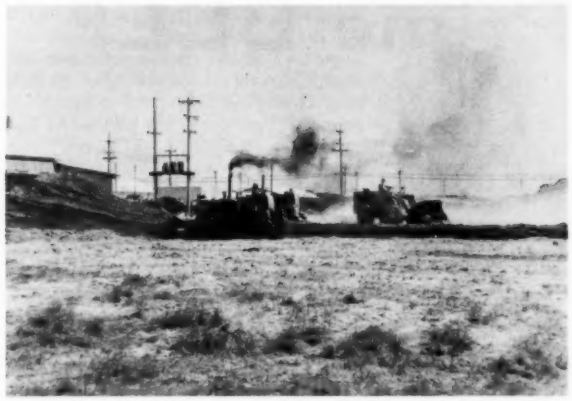
ENVIRONMENTAL PROTECTION GROUP: The FY 1973 MRP instructions will clarify some of the areas which caused confusion during FY 1972. Primarily, the difference between survey and study will be indicated. . . . . REAL PROPERTY DIVISION: All MAJCOMs were recently advised of the requirement for a statement on the environment for real estate actions. If after command review of a written assessment, it is determined that a candidate environmental statement is not required, then the rationale for the decision will be explained in a separate statement which will accompany the real estate project. . . . . The need for base officials to work closely with local land use planners to obtain compatible uses of land within the AICUZ was emphasized in a letter to commanders of all MAJCOMs having bases under consideration for AICUZ implementation. The importance of this activity will be stressed in forthcoming AFR 87-14.

PROGRAMS DIVISION: AFR 86-1 is being revised to eliminate some of the mandatory administrative requirements imposed on the RPRRD. The revision will be published in AFR 86-10, and in addition to simplifying the administration of the Board, the name will be changed to the Facilities Board. . . . . A correction: In the May 1972 issue of this Journal, it was published that "In the ultimate composition of the FY 74 MCP, there will be an attempt to assign dollar limits to major commands or the functional categories of facilities." It should have read: " . . .In the ultimate composition of the FY 74 MCP, there will be no attempt to assign dollar limits to major commands or the functional categories of facilities."

Prime BEEF Delivers Again

by Capt Floyd A. Ashdown, EIT

The need was urgent: erection of two aircraft hangars complete with access aprons, taxiways and supporting utilities. Time was a big factor. Here is another fine example of how . . .



Bulldozers and earth movers chug away as excavation begins for the taxiway at U-Tapao Airfield.

The timely acquisition of facilities to support Air Force missions has always been a major challenge to Air Force Civil Engineering (AFCE). When the facilities are to support air operations in a theater wherein active hostilities are occurring, the adjective "timely" takes on an "instant" connotation.

So it was in June 1971, when a high-level decision generated the urgent need for construction of two aircraft hangars at U-Tapao Airfield, Thailand, complete with access aprons, taxiways and supporting utilities by 1 January 1972. This requirement could not have been met through commercial contract construction at this remote base in Southeast Asia. Normal contract construction would have required 10 months under ideal conditions in the continental United States (CONUS) where maximum technical and logistical support is readily available. Further, the established machinery for project submission, approval and funding would have required more months to process, and the identification of a funding source for approximately $600,000 would have presented a formidable obstacle at a time when the money spigot was turned down so low.

Surplus Nosedocks Dismantled

It was a logical decision, then, that the most expedient and economical method of acquiring the facilities was to dismantle surplus nosedocks located within the PACAF theater, ship them to U-Tapao, and re-erect them by the use of a Prime BEEF team. Therefore, a team composition was established by Air Force specialty codes, and a 60-man team was authorized by the Civil Engineering Center and designated Prime BEEF Team 72-2. At that time, PACAF Prime BEEF resources were committed to other mission essential requirements, so the key members were drawn from SAC and other CONUS resources as well as PACAF.

Several quick command decisions were made at Headquarters PACAF:

- The military officer-in-charge (OIC) and a civilian project engineer were appointed from the PACAF staff and dispatched on 29 June to the area, where the two hangars were identified for relocation to Thailand.
- The 5th Air Force Civil Engineer was tasked to contract for the dismantling and crating of the hangars.
- The 13th Air Force Civil Engineer was directed to proceed with acquisition of necessary construction materials and to insure availability of equipment at U-Tapao.

After the initial inspection of the hangars, the civilian project officer remained to supervise dismantling, packing and shipping. The OIC proceeded to U-Tapao on 2 July to mobilize his team and to insure that the foundations would be constructed in time for immediate erection of the hangars upon

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After six months of concerted effort, the completed facilities are shown in this aerial view.

Prime BEEF
cont'd

arrival at the site. By 8 July, there were 15 men on Prime BEEF Team 72-2 at U-Tapao, the construction site had been staked out, some heavy equipment had been obtained and site preparation and earthwork had begun.

To maintain this accelerated pace, field engineering design was accomplished concurrently or slightly ahead of the actual construction effort. A topographic survey was made and, from it, a detailed plan was developed. Control points, finish elevations for floor slabs and taxiway grades were established and maintained in field books until actual design drawings were prepared. Subsequent design support was provided by engineers from the U-Tapao and Don Maung Base Civil Engineer (BCE) organizations. The project site was a relatively flat, grass-covered area, composed of an 18-inch layer of compacted sand underlain by uncompacted sand. Grubbing was done quickly, and on 9 July, finish grading was started in preparation for placing 18 inches of laterite sub-base. At this point, a soft spot was discovered near the center of the proposed taxiway. The material near the bottom of a four-foot test hole was saturated sand, having characteristics of quicksand. Several other test holes confirmed this condition as being typical throughout the job site.

Decisions Made After Consultation

Consultation with engineering personnel at U-Tapao and 13th Air Force headquarters led to the decision to excavate a depth of three and one-half feet below existing grade and increase the amount of laterite fill from 18 inches to 60 inches. This method of building thick laterite pads to support building foundations and airfield pavements had been used successfully on previous projects at U-Tapao and was found to be more economical than piling.

The excavation was backfilled with jinglestone (a local lateritic material composed of shale fragments and a clay binder). When complete, this jinglestone pad was five feet thick throughout the taxiway and hangar floor areas, and slightly thicker under the foundation. A total of 25,500 cubic yards of uncompacted jinglestone was delivered to the site by contract. Spreading, grading and compacting were accomplished by Prime BEEF personnel. The fill material was excellent as it reached densities of 137 pounds per cubic foot at seven percent optimum moisture. During most of the earthwork, a water truck was used to wet the materal as it was received in an extremely dry state. A Proctor test and periodic soil density tests were made by the site development technicians to insure proper compaction was being accomplished.

By mid-August, the Prime BEEF team had grown to 41 people including 10 Thai augmentee laborers. Most of the major earthwork was complete and attention was directed toward the hangar foundations. Each foundation consisted of 20 piers on spread footings, a six-inch thick reinforced curb wall, and grade beams between piers along the back wall and nose area of the hangar. A Headquarters PACAF decision to eliminate the large sliding front doors and door wells from the hangars precluded the requirement for door well piers and rail steel for the doors.

The foundation work and the remainder of the earthwork continued during August and into September. Progress was slow at first while the team members became familiar with forming methods and developed workable techniques for pouring the foundations. The rainy season which began in late August also hampered progress; however, despite the learning curve and the rains, the first foundation was completed on 9 September 1971. While the second hangar foundation was being formed and poured, a crew began pouring the floor slab for the first hangar.

Concrete Operations Explained

The hangar floor was designed with a center 12-inch PCC keel, 65 feet wide with 10 inches of PCC extending from the keel to the side walls. Arrangements had been made to rent a motorized concrete screed from a contractor in Bangkok to be used for the floor and taxiway pavements; however, it did not arrive until late September. In the interim, all of the 10-inch PCC slabs for the first hangar floor were completed using hand-screeding methods. Daily concrete pours during the early stages averaged approximately 50 cubic yards, but with arrival of the concrete screed, daily pours exceeded 100 cubic yards and, on two occasions, reached 200 cubic yards. This feat was not without effort since the concrete finishers often worked late into the night under portable lights to add the final touches to the concrete.

On 18 September 1971, over 250 tons of building components arrived at the deep-water port of Sattahip, Thailand, a military port operated by the U.S. Army, approximately 12 kilometers from U-Tapao Airfield. This represented quite a feat in itself. In two and one-half months after the project requirement became known, a contract had been let; a contractor had mobilized, dismantled (all of the bolts were spot welded), and crated the buildings; and the buildings were transported to Thailand. By 28 September 1971, all of the components had been moved from the port to the construction site. The PACAF civilian project officer and the Prime BEEF structural superintendent, who had also been monitoring the dismantling and shipping operations, arived at U-Tapao to assist in the erection phase. By the end of the month, the second hangar foundation was completed and structural work on the first hangar had begun.

October proved to be a very busy month. The

Prime BEEF military strength averaged 33 people and the Thai augmentee strength increased to 25. During the month, the concrete work for the taxiway and hangar floors was completed, structural steel for the first hangar was in place and steel work started for the second hangar, and framework for the operations (avionics) shop was completed.

During November, Prime BEEF efforts were concentrated on completing the structural steel for the second hangar, completing the operations (avionics) shop, installing sheet metal siding and roofing on the hangars, and installing electrical service in the two hangars. An additional 25 Thai augmentees were hired bringing their strength to 50. At the same time, the Prime BEEF military strength was gradually reduced; and by the end of the month, it stood at 14 personnel.

On 14 December, a full fledged inspection was made of the total work accomplished by Prime BEEF 72-2. The work was formally accepted by the BCE on 15 December 1971 and the following new facilities constructed by the team were added to the Air Force inventory:

- OL-BB Hangar with utilities, 10,500 SF floor area.
- C-130 Hangar with utilities, 10,500 SF floor area.
- Avionics Shop with utilities and air conditioning, 1,000 SF floor area (within the OL-BB Hangar).
- Medium-load PCC aircraft taxiway and access apron, 4,200 square yards.

The race against time was won, **Figure 1.** The obstacles encountered were considerable, including unfavorable soil conditions, inclement weather during crucial exterior work, lack of proper heavy equipment due to non-availability or frequent breakdowns, difficulty in obtaining necessary hand tools and small equipment, and assignment of personnel without the exact specialty or work experience. However, with the outstanding technical and logistical support of civil engineers at all levels, especially from the 635th Civil Engineering Squadron at U-Tapao, Prime BEEF Team 72-2 delivered the goods; and proved again the validity of the Civil Engineering Prime BEEF concept in support of the Air Force mission. CE

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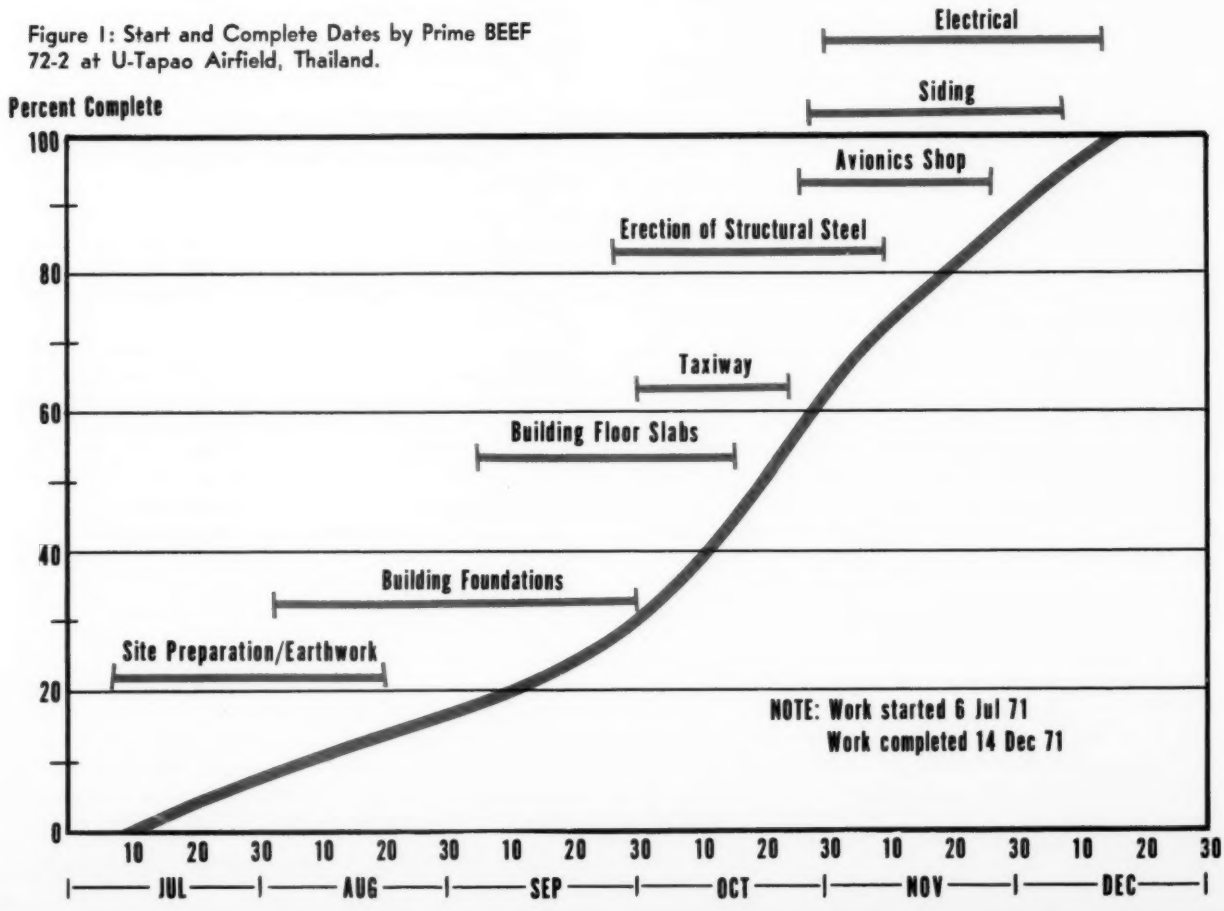
Figure 1: Start and Complete Dates by Prime BEEF 72-2 at U-Tapao Airfield, Thailand.



Worth Noting

Guidance Offered on Cleaning Family Quarters on Termination

Air Force policy (**AFR 91-1**) promotes an attitude of "homeownership" among its family housing occupants. Accordingly, occupants are expected to take proper care of their quarters, and to leave their quarters in a clean and orderly condition upon assignment termination.

Quarters cleaning standards published in **AFR 91-1** were developed in consultation with major commands and base housing officials. These standards have been generally accepted by the Air Force community; however, in some instances, complaints have arisen when the standards allegedly were applied too strictly.

To insure that unnecessary cleaning requirements are not imposed upon occupants vacating family quarters, the following guidance is provided in addition to that contained in **AFR 91-1**:

- Clearance procedures and inspections must assure equitable application of cleaning standards.
- Standards of cleanliness must be adequate to provide clean quarters for the next occupant.
- Occupants should not be expected to clean building components that are unsafe for them to reach.
- Workmen performing inter-occupancy maintenance should leave the premises in a clean and satisfactory condition.

Family quarters cleaning standards and inspection procedures require close supervision. Guidance contained in **AFR 91-1** and the above should be actively promoted by family housing managers.

Procedure for Cleaning Unit Heaters In-Place Saves Money

Dust, lint and grease are cleaned from 300 unit heaters at least annually at one Air Force base. The heating pipes are disconnected, the heaters are lowered approximately eight to 12 feet, and then are moved to the shop. Cleaning is done with a solvent and each heater is flushed with water before being reinstalled.

To save both manhours and money, a member of the cleaning crew made a suggestion to clean the heaters in-place. The procedure is as follows:

Construct a bag enclosure made of light, strong, waterproof canvas approximately five feet in diameter at the top and four feet in diameter at the bottom. Eyelets should be made near the top opening. The bottom is closed except for a drain connection in the center to which a hose is connected. With ropes in the eyelets, the bag is pulled up around the heater and secured from overhead pipes or the ceiling.

From a portable scaffold or step ladder, the heater is cleaned with a portable pressure spray using soap or detergent and flushed with a garden hose. The wash water and debris are carried by the drain through a hose to either a floor or sink drain or a container. The electrical motors should be removed before the washing process or could be covered with a suitable plastic or waterproof covering.

The cost to fabricate the canvas enclosures was less than $40. After one year, the base saved at least 50 percent of the manhours needed for cleaning the heaters. Translated into dollars, the cost saving was $5,700.

Another benefit in using this procedure is the reduction in painting and correction of piping leaks.

EPA Offers Wide Variety of Courses on Environment

Air Force Civil Engineers (AFCEs) may not be familiar with the wide spectrum of courses offered by the Environmental Protection Agency (EPA) that can help them solve environmental problems. EPA courses, which number in the hundreds, vary in length from a day to several weeks. Present programs include air pollution, water pollution, solid wastes, radiation protection and pesticides. Most programs are offered on a regional basis. Some are offered only at specialized institutes. In a few cases instruction can be taken to the student.

In AFCE terminology, most but not all courses are designed for sanitary engineers or civil engineers having the added duty as a sanitary engineer. Some courses are aimed at the manager; a few are for technicians. All courses are tuition free. If travel and per diem costs are paid, local base funds are used.

A single source of information is:

Director, Training Institute
Environmental Protection Agency
P. O. Box 30200
Cincinnati, OH 45230

Since the Director may have to refer a request for course information to a regional office or a specialized training center, any request for information should identify the writer's location (US only) and any area of special interest such as air pollution or waste disposal. Requests should be reasonably specific because there are a large number of EPA catalogs, each of which are prepared for a different geographical area or a different subject area.

How can we in Air Force Civil Engineering alter our mode of operations so that all of the participants can respond to their total work situation in a positive manner and voluntarily increase their productivity?

Quo Vadis?

Col Joseph Adamo, PE

"Where is our organization going?" Most of us in Air Force Civil Engineering (AFCE) have asked this question of ourselves at one or more times during our careers. The Civil Engineering Management Review Program explains in broad terms where our organization should be heading. It lists 11 major objectives each organization should be striving for; however, many of our organizations do not really use these goals as their guiding lights. At lower levels, this is normal; but how about the higher levels? Our observation is that AFCE objectives are not meaningful to the majority of our people and for reasons which will be discussed.

Let's take a look at the first and most important objective of AFCE: increasing work force productivity. If we took a broad or liberal view of the definition of productivity, the other 10 objectives could be considered sub-objectives of this one main goal. Theoretically then, by increasing productivity across the entire spectrum of AFCE functions, we could accomplish our objectives and have a better insight as to where our organizations are heading. Now comes the $64 question: how do we do it?

Productivity Approach Used in AFCE

We can start by historically examining this important commodity. In AFCE, we have mainly used the Productivity Approach to management which is the oldest of the present day management philosophies. It centers on learning how to produce in abundance and consists of four areas:

- Scientific Management: Epitomized by Frederick W. Taylor, this school of thought believes any management problem should be subjected to critical analysis, inventive experiment and objective evaluation.
- Personnel Management: Accepts the technology as given and focuses on building a competent, well-motivated work force.
- Internal Financial Management: Budgeting and cost analyses for planning and control.
- Technological Aids: Mechanization and automation for planning, controlling and producing goods.

At the present time, AFCE does not appear to be using, to any great degree, the remaining three approaches to management, that is, behavioral, rationalistic model and institutional.

The behavioral approach is based on findings of the behavioral scientists. Its orientation is research rather than the successful practice emphasized in the productivity approach. Consequently, in seeking guides for management practice, we have to select those findings that relate directly to managing and then try to recast the ideas into operational terms.

Operation of an Enterprise Analyzed

The rationalistic-model approach is used to analyze the operation of an enterprise. Many of the theories proposed are built on the premise that reason is a source of knowledge itself, superior to and independent of sensory perceptions. This rationalistic view is quite different from, and complements the behavioral approach. The nature of this approach can be seen in the types of analyses performed in micro-economics, systems engineering and operations research. We use a portion of micro-economics in the form of cost analysis and, at times, the systems engineering approach to design. Discounting the search for new knowledge and limiting the scope of operations research as a technique for selecting a course of action, it has three features that distinguish it from less formal decision-making.

1. Problems are stated in mathematical symbols.
2. A set of equations or "model" is designed for each problem. The model shows the various factors that should be taken into account and the relationships between them, plus the presentation of an orderly picture of the total problem.
3. Quantitative data must be provided for each of the variables. Subjective judgments and values must be expressed in numerical terms. Then by injecting the data into the model and completing the mathematical computations, a highly rational decision can be made.

The institutional approach puts emphasis on

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Quo Vadis? *cont'd*

adapting management practices rather than on building refinements based on outdated assumptions. The institutionalists insist that the social institutions, of which management is a part, are evolving entities. They further insist that we closely monitor the environment, especially those parts that are changing, as well as giving attention to the accepted practices, customs and laws with which managers operate. To a great extent, every enterprise is conditioned by its environment. Because we like to think of managers as masters of their own actions, we tend to overlook environmental forces which encourage or restrain the decisions of a manager.

The ideas arising from the productivity, behavioral and rationalistic-model approaches to management often overlap. For instance, the Industrial Engineering Section's new quality control program becomes a "change in role expectations" to the behavioral scientist; the rationalist places into his equation a single symbol that represents years of research by behavioral scientists. Nevertheless, each approach contributes distinctive insights. At this particular point in time, it would appear that the rationalistic model and behavioral approach offer the greatest probability for positive gain; therefore, let's examine these two possibilities.

. . . effective workers can be dedicated to doing their jobs well and at the same time be indifferent to the broad mission objectives.

Today's environment of automated management information systems offers us unlimited opportunities for improving productivity through the use of the rationalistic model approach. Many of us have suffered with the mounds of automated printouts these systems have produced, but they can be the first step in a closed loop system. If we press forward and combine the present management information systems with analyses and decision systems, the savings in time and manhour expenditures would be fantastic. Many analyses programs are already in existence in tape libraries. We have the technology for writing the decision portions of the programs. Once these types of systems are working, we could easily and quickly ask the computer to analyze and make decisions regarding the information in our various reports such as the C-128, C-172, 1-HAF-Z17, 4-HAF-Z17, etc. The Military Construction Program and the Operations and Maintenance programs, for example, could be racked up in priority order by the push of a button if the bases and commands followed certain rules of scoring certain factors prior to keypunching the cards. In fact, a good portion of the prevailing financial/political philosophy could probably be programmed into the decision model by this same method or the use of utility/value functions. These are merely a few possibilities; there are many, many more. Studies have shown that simple linear decision models with a limited number of scored variables have made as good or better decisions than experts who had no such constraints placed upon them. We know this frightens many people, but it shouldn't. People, not the machines, will still be making the decisions. After all, people design the models, people score the weighting factors and people can review and change machine decisions. This kind of mental fear should not deter us from going forward in this area.

Now let's take a look at the behavioral approach to management. In USAFE, we recently installed the Controller Concept, Visible In-Service Work Plan, Structural Maintenance and Repair Teams (SMART), and Fast Action Service Teams (FAST). They have all contributed toward increasing productivity at the base level; but even here we admit to a weak link, the **individual worker.**

Although the system controls, supervises and directs him more efficiently than ever before, he can still take longer than necessary to accomplish assigned tasks or to call his controller upon completing the assigned tasks. How about the rest of Base Civil Engineering? Doesn't a certain amount of this same

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lack of motivation exist there also? If we are honest with ourselves, the answer will be Yes. Alright, then, how do we solve this problem? We might be pleasantly surprised to discover that several experimental studies and findings of the behaviorial scientists relate to this portion of our productivity dilemma. The following are a few studies we could use to help increase productivity and give our people a better working environment.

Workers' Attitudes Are Important

• The Hawthorne Experiment: A study by a group of psychologists and sociologists at the Hawthorne Works of the Western Electric Company in Chicago between 1927 and 1932. During this study, workers were continuously observed under varying conditions of work. Rest periods, lighting, work week and other conditions were changed but output did not vary in the anticipated manner. Output remained high when conditions were made less attractive. Apparently physical working conditions were outweighed by other factors. Management had assumed the workers were motivated by pay based on an individual and group premium for output. The experiment proved that production had been increased because of a change in the workers' attitudes toward their jobs and their work team. By seeking the workers' assistance and cooperation, the researchers had made them feel important. The workers no longer felt themselves to be cogs in a machine; instead, they were a compatible group trying to help the company solve a problem. Each worker was motivated by an inner drive to find an environment where he belonged, where the purpose of his work was apparent and where a high level of performance gave him a feeling of importance. Without such an environment, the worker developed frustrations. Such frictional factors as boredom, monotony, fatigue, absenteeism, restricted outputs, etc., appeared to be the effects of this frustration. In their conclusions, the researchers stressed that workers respond to their total work situation and that attitudes and social relations constitute an important part of this total.

Strength in Group Problem Solving

• Group Decisions: When using this method, all members want agreement, but they also want to make their own points heard. So they bargain, they compromise, and the final product is often a potpourri that no group member really believes in. And when group members expect their decisions to be inadequate, they usually are. But **there can be strength** in group problem solving. Jay Hall has reached two major conclusions from his studies of group dynamics:

1. Groups function as their members make them function.
2. Conflict, effectively managed, is a necessary pre-condition for creativity. Thus, when they follow a few brief instructions, **decision-making groups can be expected to do better than even their best members,** at least on multiple-judgment tasks of the sort studied. There is nothing in the group process that makes committees, boards and panels inherently inept. Ludicrous, ineffective solutions to problems are the product of groups that are pessimistic about their own potential and have imperfect ways of dealing with conflict. There is a danger involved with this type of decision-making that must be constantly guarded against. It is what Irving L. Janis calls, "groupthink"—a term he used to refer to the mode of thinking that persons engage in when concurrence-seeking becomes **so dominant** in a cohesive in-group that it tends to override realistic appraisal of alternative courses of action. The symptoms of groupthinker arise when the members of decision-making groups become motivated to avoid being too harsh in their judgments of their leaders' or their colleagues' ideas. They adopt a soft line of criticism, even in their own thinking. At their meetings, all the members are amiable and seek complete concurrence on every important issue, with no bickering or conflict to spoil the cozy "we feeling" atmosphere.

Higher Participation, Better Productivity

• Management/Leadership Styles: There are basically four distinct ways to manage and lead, **Figure 1.** The findings of the behavorial scientists indicate that the higher the participation, the higher or better the productivity results achieved. We all use a combination of these methods in our business, but the least used (if used at all) is "participative/management."

With the above findings in mind, how can we in AFCE alter our mode of operation so that all of the participants can respond to their total work situation in a positive manner and thereby voluntarily increase

cont'd next page

Figure 1: Four Ways to Manage and Lead.

Quo Vadis? *cont'd*

their productivity? I submit that this can be done if we accept the following assumptions:

- People at different levels of command live in different environments; therefore, their objectives are different.
- Different commands have different objectives.
- All of the above sub-objectives make up the multiple objectives of the Air Force.

Since we are talking about objectives, let's borrow from Peter Drucker, who developed the concept of management by objectives, and see if his vehicle can help us achieve the bountiful results predicted by seeking the workers' assistance and cooperation, and by instituting, where feasible, participative management and group decision-making.

Each Has Variety of Needs

Each person has a variety of needs that he strives to fulfill. To the extent that an individual accepts the company's objectives as being desirable, fulfilling them becomes one of his needs. Therefore, he must understand the objectives of his job if he is to work most productively. Why then don't we let our people set **their** particular section's objectives? The emphasis should be on tough but achieveable goals because:

- Frustration or indifference is apt to develop if stated goals are rarely, if ever, achieved.
- Objectives are used for planning and coordination as well as for motivation. Related activities may get fouled up if synchronized with an objective that proves to be too idealistic and not in the realm of reasonable prediction.

A sense of accomplishment—of meeting objectives—is desired by men at all levels. Allowing them a fair degree of input in setting their section's course should result in more motivation to achieve the established goals since they become **their goals.** The goals set by each of these subunits must contribute to the aims of the larger unit of which they are a part. At the base level, for example, the Section Chiefs, Branch Chiefs, Base Civil Engineer and Base Commander/Wing Commander/Area Materiel Commander, etc., must each, in turn, buy off on the objectives that are set for that year. Command Civil Engineering must then review each individual base's objectives to see whether or not they are proper subunits of that particular command's multiple objectives. AFCE should review the objectives of each of the major commands to be sure they are proper subunits of USAF's multiple objectives. In other words, we have made a year's contract regarding **where we intend to go.** This doesn't mean that the objectives are fixed in concrete. Shifts in mission, etc., may occur and since the specific objectives of particular subunits have to help accomplish the broader multiple objectives, a change in some objectives may be required. Only at that point should changes be considered for that particular year. By following this course of action we would be using a form of participative management and group decision methodology through the entire organizational spectrum.

Objectives Provide Benefits

When properly set forth and accepted, objectives provide the following benefits: individual motivation, unified planning, voluntary coordination, standards for control and a basis for decentralizing. It must be understood that too many objectives can be troublesome, especially for a single individual. Some executives feel the number should be narrowed to the range of two-to-five to assure concentrated attention; others contend that man can keep a dozen objectives in mind. In either case, agreement exists that motivation is improved by limiting the number of objectives.

Since AFCE has long-term goals, these yearly short-run objectives can make the major tasks more manageable since they are divided up into small pieces. This is good because **effective workers can be dedicated to doing their jobs well and at the same time be indifferent to the broad mission objectives** (this is why Headquarters Air Force objectives are not meaningful to so many of our people). The creation of short-run objectives helps make the broader objectives tangible and meaningful for managers, provides the means of bridging the gap between hopes and expectations, plus providing benchmarks for measuring progress.

Organizations Must Be Graded

If we accept this approach and use it, we must also accept a change in the grading process. The organizations and their parts must be graded on these objectives instead of the myriad of directives, etc., that now constitute portions of an IG inspection. This doesn't mean that compliance items shouldn't be looked at but it does mean that they must take a back seat to the objectives. The objectives must be the organization's guiding lights. If the organization is reaching the agreed upon objectives, it passes the inspection regardless of the compliance items.

It will take a lot of guts to try it out; it won't be easy. Many of our "TELL" managers and leaders will feel completely insecure and many commanders will have several second thoughts about group decisions regarding goals and how they fit into the overall picture. But again, the potential dividends appear to be so great in this area that we just cannot afford NOT to try. And, as an added benefit, **we will know where we are going.** CE

Outstanding Cadet Award Presented at Air Force Academy

The Seventh Outstanding Cadet in Civil Engineering Award was presented to then Cadet 1st Class Peter U. Sutton at the Scholastic Honors Ceremony at the US Air Force Academy (AFA) in June. Maj Gen M. R. Reilly, Director of Civil Engineering, Headquarters US Air Force, made the presentation.

The Award is presented by the civil engineering officers of the Air Force in memory of Maj Theodore R. Loeschner, Jr, who was killed in action while on an air transport mission in the Republic of Vietnam in 1965. A former instructor at the Air Force Academy, Major Loeschner was the first civil engineer officer killed in Vietnam.

Lieutenant Sutton, who graduated with a bachelor of science degree in civil engineering, was also presented the Outstanding Cadet Squadron Commander Award in memory of Gen Hoyt S. Vandenburg. Lieutenant Sutton is attending the University of Illinois to obtain a master of science degree in civil engineering under the Air Force Academy's cooperative master's program, which enables qualified graduates to obtain their advanced degree within seven months after graduation. In the spring of 1973, he will enter undergraduate pilot training at Laughlin AFB, Texas.

Cadet Peter U. Sutton was presented the Outstanding Cadet in Civil Engineering Award by Maj Gen Reilly.

As a Cadet, Lieutenant Sutton was on the Dean's List for excellence in academics for seven of eight semesters and the Superintendent's List for excellence in both academics and military training for four semesters. He was president of the Cadet Civil Engineering Club and was a member of the Cadet Chorale, Protestant Cadet Choir and Ski and Saddle Clubs.

Journal's New Look Is Most Significant Ever

The **Air Force Civil Engineer** journal is sporting a new look for the first time since its establishment in February 1960.

The recent past years are dotted with dramatic change within Air Force Civil Engineering. For several months, the editorial staff has been working on a new format to better reflect the image of Air Force Civil Engineering. After months of preparation, we have settled on the format that is in evidence throughout this issue. We are proud to present the new Journal.

We have selected RED HORSE as our cover and lead feature article for the introduction. RED HORSE is an excellent example of how Air Force Civil Engineering responded to changing requirements during the 1960s. In the 1970s however, RED HORSE itself is faced with change, and again, Air Force Civil Engineering is responding with redirected requirements.

So it is with the new format of the Journal. It is our hope that the new format will provide easier reading and will keep pace with the changes placed before Air Force Civil Engineering.

Our readers' reactions are important; therefore, we ask their comments on the new look. As the fine print in the Table of Contents page announces, "Contributions, suggestions and criticisms are welcome." Let's hear them from you!

Fire Box

3rd QUARTER FY 72, 1 JAN 72 TO 31 MAR 72,
USAF REAL PROPERTY/MATERIAL FIRE LOSSES

COMMAND	NO. FIRES	USAF $ LOSSES
AAC	2	$ 248
ADC	8	8,932
ACIC	0	0
AFCS	0	0
AFSC	10	5,831
ATC	36	8,718
AU	2	209
AFLC	11	4,241
MAC	8	7,721
TAC	14	18,007
HQ COMD USAF	6	15,938
CINCPACAF (CONUS)	5	660
CINCPACAF (OVERSEAS)	5	9,827
CINCSAC	32	55,877
CINCUSAFE	8	2,020
USAFSS	6	506
USAFSO	0	0
AFRES	0	0
USAFA	0	0
AFAFC	0	0
AFSC	2	1,000
TOTAL	155	$139,735

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SCI & TECH

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CEC Moves to Tyndall AFB; Journal Returns to AFIT

The Civil Engineering Center, formerly a field extension of the Directorate of Civil Engineering, Headquarters U.S. Air Force, has been relocated from Wright-Patterson AFB, Ohio, to Tyndall AFB, Florida. The physical move of personnel and all equipment will be completed by 1 September 1972. Business continues as usual with no interruptions.

In the move to its new location, the Center also became a new element of Air Force Systems Command. Now known as the Air Force Civil Engineering Center (AFCEC), it continues to operate and function much in the same manner as when it was a field extension of the Directorate of Civil Engineering. It retains its responsibility for civil engineering mobility to respond to air base contingencies on a world-wide basis; and it continues to provide unit training and a host of specialized technical services to the field in a number of engineering areas. (A detailed article on the move to Tyndall AFB and the functions of the AFCEC will be published in the November 1972 issue of the **Air Force Civil Engineer** Journal.)

The only effect on functions has been in the area of such activities as fire protection, contingency planning, etc., which are policy making elements. These activities have been retained by the Directorate of Civil Engineering.

The following address will be used on all official correspondence:

MAIL: AFCEC
Tyndall AFB, FL 32401
MESSAGE: AFCEC/TYNDALL AFB, FLORIDA

In a related move, the **Air Force Civil Engineer** journal, which had been located in the Center at Wright-Patterson AFB, Ohio for the past year, has been returned to the Civil Engineering School, Air Force Institute of Technology, Wright-Patterson AFB. The address and telephone of the Journal editorial offices are:

Air Force Civil Engineer Journal
AFIT/DE
Wright-Patterson AFB, OH 45433
TELEPHONE: Autovon 78,
Extension 53256.

Newman Medal, Curtin Plaque Winners Named

Brig Gen Archie S. Mayes, Deputy Chief of Staff for Civil Engineering, Strategic Air Command, Offutt AFB, Nebraska, and the 3202nd Civil Engineering Squadron (CES) at Eglin AFB, Florida, were named the recipients of military engineering awards by the Society of American Military Engineers (SAME) in May. The awards were announced at the 62nd annual Military Engineer Dinner at Fort Myer, Virginia.

General Mayes accepted the Newman Medal in recognition of his outstanding leadership and direction in pioneering, promoting and implementing major innovations in resource and work force management. The SAME citation read that these improvements have been successfully proven and installed first in SAC, then throughout the Air Force, through his efforts.

The Newman Medal, named in memory of Maj Gen James B. Newman, Jr, is offered to a member of the Directorate of Civil Engineering for the most outstanding contribution to military engineering through achievement in design, construction, administration, research or development.

The 3202nd CES, commanded by Col Truman O'Keefe (recently retired), was named the recipient of the Curtin Plaque for outstanding management of civil engineering resources and improved technical support of a complex research and development mission. The Plaque will be presented to the CES at a date to be announced by the Directorate of Civil Engineering.

The Curtin Award is a plaque named for Maj Gen Robert H. Curtin, former Director of Civil Engineering and a past president of the SAME. It is offered as an annual award to the unit of the Directorate of Civil Engineering selected as the most outstanding during the year.

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